THE ORGANIC CLOVIS:
A SINGLE CONTINENT-WIDE CULTURAL ADAPTATION

By

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A DISSERTATION PRESENTED TO THE GRADUATE SCHOOL OF THE
UNIVERSITY OF FLORIDA IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

UNIVERSITY OF FLORIDA

2004

ACKNOWLEDGMENTS

A list of individuals who have made it possible to complete this document would be as large again as the bibliography. To all of my fellow archaeologists, anthropologists, bike racers, friends and family I extend my most heartfelt gratitude for engaging in or suffering through endless Clovis, Paleoindian, and "Do you know why this bone is important" discussions. It is quite humbling to realize how many people have buoyed my spirits, aided materially, and even provided shelter during this process. If this work has any merit, and I have become fit to create more, it is due in large part to the opportunity provided by those who helped me get this far. If I am able to create similar opportunity for others the opportunities provided for me shall not have been wasted.

Beyond a shadow of a doubt S. David Webb stands alone as mentor, supporter, and friend. The debt of gratitude I owe William O. Gifford is as equally profound. Lacking the assistance of these two individuals, pursuit of the endless dissertation would have ended. Unable to articulate my thanks adequately I simply continue to forge ahead, as they have helped me do for so long.

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Abstract of Dissertation Presented to the Graduate School
of the University of Florida in Partial Fulfillment of the
Requirements for the Degree of Doctor of Philosophy

THE ORGANIC CLOVIS:
A SINGLE CONTINENT-WIDE CULTURAL ADAPTATION

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May 2004

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Major Department: Anthropology

The Clovis culture is a continent-wide phenomenon exhibiting a high degree of uniform behavior and patterned resource exploitation irrespective of localized environmental constraints that typically circumscribe historically known societies. A state of the art specialized technological adaptation facilitated a generalist subsistence adaptation that is without an analog in historically or ethnographically known cultures. The Clovis cultural adaptation was a direct response to unique environmental settings that existed during the Pleistocene. The Clovis culture does not represent a unique cultural manifestation any more than each culture is unique. Clovis appears fundamentally different simply because we lack anything with which to effectively compare it.

Data from 246 Early Paleoindian sites with preserved organic remains are assembled to document patterns in resource preferences and exploitation. Artifacts made from identifiable elements of extinct taxa are considered the most reliable indication of

direction action. In sum, 352 species of plants and animals have been recovered at Early Paleoindian sites across North America. One-hundred sixteen of those species have clear evidence of utilization by Early Paleoindians. This represents a tremendous jump in our understanding of Clovis diet breadth and resource selection patterns. Clovis people had a clear preference for mammoth and mastodon. That said, exploitation of now extinct megafauna was simply a portion of an effective generalist foraging adaptation that covered unglaciated North America.

A large portion of the technological adaptation involved formal bone and ivory tools that are typically underreported or under-appreciated as part of the Clovis toolkit. Nearly 250 formal bone and ivory tools in 45 different forms are now documented across the continent.

Clovis the archaeological culture represents an integral step between Old World Upper Paleolithic cultural antecedents and later New World Paleoindian groups. Thorough understanding of Clovis unto itself must precede discussions of what is Pre-Clovis and what is not Clovis. Defining a culture by what it is not serves to confuse separate lines of evidence that must be understood individually prior to comparing them with other cultural manifestations.

CHAPTER 1
INTRODUCTION, EARLY PALEOINDIAN DEFINITION, PROBLEM ORIENTATION, AND SITE NOTES

Introduction

From the inception of modern Paleoindian research discoveries of organic remains have played the pivotal role in determining human involvement with the Pleistocene landscape of North America. Here, Clovis is redefined as a continent-wide generalist foraging adaptation to specific circumstances of the Terminal Pleistocene based on synthesis of plant and animal remains on this continental scale. Additionally, nearly 250 formal organic tools clearly demonstrate cultural continuity hinted at by Clovis projectile point similarities in North America.

The first acceptable proof that Pleistocene humans existed in America hinged entirely on the discovery of unequivocal human artifacts directly associated with bones of an extinct form of bison in a closed context near Folsom, New Mexico (Figgins 1927). Among hominids only modern *Homo sapiens* have ever been found in the New World. Seeking primitive forms, or characters, of Pleistocene hominids was entirely fruitless, but long advocated by some researchers (Hrdlicka 1937). Therefore, the direct association of artifacts with extinct Rancholabrean fauna in Pleistocene age geologic sediments was the only acceptable level of proof that people were in North America during the Pleistocene. Independent verification with radiocarbon dating came more than twenty years later. At Folsom, short-term subsistence activities were preserved through a particularly fortuitous combination of geologic deposition and erosion that both preserved and allowed for the recovery of the archaeological material nearly 11 millennia later.

The value of Folsom points as diagnostics of Pleistocene humans was recognized shortly thereafter based largely on additional Folsom discoveries at Lindenmeier, Colorado (Roberts 1935; 1936). Folsom or "Folsomoid" points were repeatedly found associated with *Bison antiquus* and *Mammuthus columbi* at several sites across the High Plains. The larger Clovis points found at Blackwater Draw associated with mammoth bones in the mid 1930s were stratigraphically separated from classic Folsom points, where here again were associated with extinct bison remains (Bouldarian and Cotter 1999). John Cotter called all the fluted points Folsom but felt there might be game specific "calibers" to explain the differences he observed. This notion is discussed at length in Chapter 5 (Cotter 1938:117).

The persistent use of the terms "Folsom-like" or "Folsomoid" in the literature created a good deal of confusion, even among Paleoindian specialists. In the 1949 3rd edition of *Ancient Man in North America,* Marie Wormington notes that these terms should have been replaced by the more generic Fluted Point after the 1941 Early Man Symposium in Santa Fe but unfortunately continued to be used at the time of publication (Wormington 1949:33). Further, Clovis points were defined as a distinct type at the 1941 conference and published almost immediately in a paper written by E. B. Howard (Hurst 1942:65). However, Howard termed the Clovis point "Ohio Fluted." It took several more years for Ohio Fluted to be synonymized with Clovis and gain widespread usage. As late as 1948 Chapman illustrated four unequivocal Clovis points from Missouri as "Folsom-like" (Chapman 1948, fig. 31:2-5). In 1949 Wormington herself used the terms

Clovis and Ohio Fluted (replaced with Cumberland in Wormington 1957) in a fashion intended to demonstrate these points were not Folsom rather than to define them independently as had been done several years before (Wormington 1949).

In the 80 intervening years since the Folsom discovery, literally hundreds of Early and Middle Paleoindian archaeological sites with preserved extinct faunal remains have been excavated. The only extinct taxon clearly associated with post Clovis archaeological "cultures" in North America is *Bison antiquus*. The typological uncertainty discussed above coupled with the oversimplified monospecific subsistence models of Clovis mammoth hunters and Folsom bison hunters has lead to an often critiqued, never revised, view of how Paleoindians made their living (Dincauze 1993; Meltzer 1993a). This oversimplified view has lead Don Grayson and David Meltzer to repeatedly assert that the Clovis people, who made 13,000 fluted points, stopped to eat, only proboscideans, 14 times in 800 years (David Anderson personnel communication 2004; Grayson and Meltzer 2003:588; Meltzer 2004). To date only partial treatments of Clovis subsistence practices have been attempted. Paleoindian archaeologists have developed a much better understanding of some stone tools while most other cultural topics, including diet, have been neglected.

Nearly forty years have passed since James Fitting commented that "most American archaeologists have been developing an anthropological approach to the interpretation of their subject matter, "Paleo-Indianists" have become, if anything, more historically and typologically oriented" (Fitting et al. 1966:131). Michael Shott (1990:4) was even more critical fifteen years ago saying essentially that the focus of Paleoindian work has been chronology, typology and technology, which has done little more than "document the antiquity of technical virtuosity." There has been a great deal of archaeological and zoological data generated that languishes for want of attention to issues other than site context and projectile point typology. Advances in understanding of geoarchaeological topics and lithics have outpaced treatment of other cultural issues.

Geoarchaeology has progressed greatly in the last several decades, but at a price. Attempts at broader cultural reconstruction from original data have largely been shelved during this period. There are two main reasons for this: (1) methodologies and conclusions are and always will be contentious; and (2) however well conceived and supported our cultural synthesis may become new data and new analyses will overturn our current interpretation of the information we have available. Authors tend to publish safe incremental units of new data and stop. The tendency to localize our view of Paleoindian adaptation further exacerbates this situation. The full range of variation is much larger than our expectations or a single researcher's experience. Recovered data is chronically underreported, making synthetic compilation very difficult. A given discovery will be compared to local Paleoindian material and possibly to one of the better known Clovis sites such as Blackwater Draw, Lehner Ranch or Murray Springs (Hester 1972; Haury et al. 1959; Haynes and Hemmings 1968). Summaries of this kind of work fill each issue of *Current Research in the Pleistocene*. *CRP* should be a starting point for presentation of new data, not the least publishable unit one is able to get away with.

Geologic and chronologic order are still questions of great import. However, detailed description of a sites stratigraphic sequence should not replace analysis of the cultural adaptations and the artifacts we unearth. Basic questions of Paleoindian culture history remain unanswered for the unpopular theoretical stance as much as a lack of data.

This problem is acute in Florida where the proposed Clovis-Simpson-Suwannee sequence is not able to incorporate rarer materials diagnostic of Redstone, Cumberland, Dalton and other ephemeral Paleoindian occupations (Dunbar and Hemmings in press). Directly dated Clovis material in Florida comes from only one site (an ivory point haft from Sloth Hole 8JE121: 11,050+/-50 SL2850). Holocene age Early Archaic Bolen sites are the first firmly dated sites in Florida's cultural sequence, circa 10,300 to 9,900 radiocarbon years before present (RCYBP) (Dunbar et al. 1989). Beyond this solid but limited data we are reduced to typological homologies with material from outside of Florida.

This work is an initial attempt to fill a critical need in Early Paleoindian studies, namely, detailed examination of known Clovis organic material culture and subsistence remains. Aspects of the more commonly discussed diagnostic points and stone tools are coupled with extensive Clovis faunal association information throughout. The specific questions presented revolve around a unifying issue: Is there a single Clovis adaptation? And if so, exactly what does this adaptation consist of? Chapters detailing faunal remains and osseous tools will form the bulk of this presentation and analysis. Chapter Two describes faunal remains from Early Paleoindian sites in taxonomic order. These are broadly considered in two main categories: observed potential food sources, and all observed utilized food sources. Patterned usage and conspicuously absent fauna are considered as well. Early Paleoindian osseous artifacts from North America are compiled in Chapter Three. These tools are the best direct evidence we have regarding utilization of specific animals. Data recovered in Florida's rivers over the last three decades tremendously augment our view of Early Paleoindian behavior and specific activities these people engaged in as part of their technological adaptation. Clovis subsistence, literally the specific dietary items utilized and the known means of procuring that diet, are the focus of Chapter Four. These data have been extracted from the published literature regarding 167 sites across North America coupled with new data from 69 sites in Florida. Even while tremendously broadening our view of Clovis over the years of archaeological work, we are still confined almost entirely to subsistence related topics. Chapter Five provides a broader view of patterns of resource exploitation discernable from what has been compiled of Clovis material culture and faunal utilization. The conclusions drawn in Chapter Six reiterate exactly why Clovis seems to be a unique cohesive continental adaptation and offers useful avenues to follow in future research.

Early Paleoindian Definition

Before proceeding, the definition of Paleoindian used here needs to be made explicit. Using geologic, faunal and cultural criteria, a case is made that only Clovis material should be considered Paleoindian. Certainly there is room for much debate but splitting this fine intellectual hair is intended to help discriminate a broad cultural entity (Paleoindian) into its proper component parts, regrettably only identifiable by projectile points at present: Clovis, maybe Sandia, maybe Goshen, possibly Simpson but specifically not Gainey, Folsom, Suwannee, Cumberland and other later examples. Admittedly there is little hope that Paleoindian will become a synonym for Clovis in the literature. The purpose here then is to plant the thought that Clovis is fundamentally different than anything with which we would hope to compare it chronologically, geographically and most important culturally.

The term Paleoindian should be derived primarily from a well defined cultural adaptation (diet and technology are the best known aspects) that corresponds to a time period (>11K RCYBP?), reflecting a specific set of environmental/ecological parameters. Two chronological observations regarding Pleistocene geology and fauna bear inclusion. First, Pleistocene geology is distinct, ending with the black mat in the Southwest circa 11,000 RCYBP and the depositional onset of gray silt in Florida rivers sometime after circa 12.300 RCYBP (Haynes 1984:346). Second, the Pleistocene land mammal age consists of numerous unique members: The Rancholabrean land mammal age ends about 11,000 RCYBP when everything that went extinct other than *Bison antiquus* died off. Only Clovis (and maybe Goshen or Sandia) meets the full definition laid out below. Folsom and all other later "Paleoindian" groups are defined by technological adaptation only. Clearly there is technological (and biological?) continuity into the Holocene among Paleoindians. But tremendous changes occurred to the environment, the plants and animals on the environment, and the cultural form of adaptational response to the environment at any given time. Clearly, the differences between Clovis and later Paleoindian or Eaarly Archaic groups are not limited to stone projectile points.

In sum, we have a definable chronological period, differential geologic strata at the termination of the Pleistocene, the Rancholabrean faunal extinction event, a flora that rearranges itself, and the specific culturally manifested adaptation to these variables in an enormous geographic area (essentially unglaciated North America). The geographic distribution of Clovis is far and away the largest among the groups traditionally defined as Paleoindian (the broadest cultural distribution until historic times). At a minimum

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Clovis should be considered the only Early Paleoindian cultural adaptation. These terms are used as synonyms throughout this work.

The specific details of the Early Paleoindian Clovis cultural adaptation are the focus of the remainder of this work. Compilation of observed faunal and technological phenomenon precede discussions of broader cultural issues.

Problem Orientation

Clovis points are found continent wide in North America. This diagnostic stone tool is most commonly associated with specialized mammoth hunting in the literature (*sensu* Martin 1984b). The mammoth dominated hunting model is an overly simplistic monospecific dietary pattern which has been widely challenged while remaining the only well articulated mode of Clovis subsistence (Dincauze 1993; Meltzer 1993b). Most Paleoindian specialists consider Clovis material culture to be a continent-wide, consistent phenomenon (Collins 1999a; Haynes 1982; Meltzer 1993a; Sellards 1952; Tankersley 1998; Wormington 1957). However, the tool kit consistency is contrasted with what Meltzer, and others, view as an Eastern Clovis subsistence shift from specialized hunting to generalist foragers (Meltzer 1993b).

As argued here, the view of Clovis people as generalist foragers is entirely correct and needs to be extended continent wide. Clovis people utilized a specialized technological adaptation designed to facilitate a generalized foraging adaptation. Our inability to identify this specific form of adaptation is the product of poor archaeological preservation and visibility, reporter bias, and the critical lack of a historic or ethnographic analogy with which to compare Clovis. The regional, piecemeal, view of Clovis is further parochialized by the lack of synthetic treatment of the archaeological data that have accumulated over 80 years of excavations in Paleoindian sites. The gathered data address this set of issues in the broadest fashion feasible from the known archaeological record.

The overriding desire to determine exactly what we know about Clovis as a cultural entity requires that several empirical building blocks be created before the broad adaptation question can be answered intelligently. Those used here to assess the overall cultural adaptation question are: What exactly did the Clovis diet consist of? What does the range of surviving Clovis subsistence technology look like in total (stone tool patterns combined with all known organic technology)? Further, in conjunction with the dietary and subsistence technology summaries what other lines of evidence can be marshaled regarding the broader Clovis culture (particularly resource exploitation patterns)?

The diet and subsistence technology summaries use three nested sets of data regarding all fauna directly associated with Early Paleoindians (the potential subsistence base), extracted from that are the unequivocally utilized fauna (based on modification and/or direct association data- considered the observed subsistence base), and the smaller utilized fauna subset of Pleistocene mammals made into unequivocal formal tools by Early Paleoindians (the organic subsistence technology). Distinguishing these hierarchal categories allows for identification of the recovered diet and subsistence information presented in Chapters two, three, and expanded in Chapter four. These datasets cover potential dietary items, actual dietary items, and the material cultural remains not comprised of stone tools. The animal data come essentially from 85 Clovis; 4 Goshen; 5 Folsom; 6 Gainey; 1? Midland; 1? Plainview; 2 Chesrow; 1 Angostura; 2? Scottsbluff; 2

Hell Gap; 3? Sandia; and several additional sites that lack currently recognizable diagnostic stone artifacts. All post-Clovis cultural associations with extinct fauna, listed above, have problems. Namely, extinct animal remains are differentially preserved or represented (single bones usually) or the stratigraphic integrity or association with later cultural material is highly suspect. No post-Clovis extinct faunal association gets beyond inclusion in the observed potential category. It is asserted in Chapter 3 that formal tools, made from identifiable extinct animal elements, could only have been manufactured by Clovis people or as yet undefined Pre-Clovis people. It is later argued that extinct animal formal bone tools should be considered diagnostic Clovis artifacts.

Sites

Two-hundred forty-six Early Paleoindian archaeological sites with associated floral and faunal remains from across North America are compiled in Appendix 1. This dataset is intended to include every site with a sound association of extinct fauna and early humans in the New World. Additional categories of information include: county and state listings (where applicable); cultural affiliation and diagnostic artifact frequency; and comments on associated fauna. The Key to Appendix 1 provides detailed explanation of each category. In addition to the individual site list, detailed treatment of each site is included in the text where relevant to issues under consideration. Special consideration is given to the original data from the 69 Paleoindian sites in Florida with well preserved organic remains.

Within the United States there are no faunal/Early Paleoindian associations in 16 states. The 33 remaining states are included in the appendices. Clovis points have been recovered in every state except Hawaii. The 16 states not included in the faunal appendices are mostly represented in sections where the stone artifact data is relevant, particularly in the Midwest and South. Clustering of states with exceptionally poor organic preservation at Paleoindian sites is clearly visible in Table 1:1 listed below:

Table 1:1 States lacking Early Paleoindian associated fauna

States	Comments
Connecticut, Delaware, Maryland, New Jersey, Rhode Island, and Vermont	All are small Northeastern states with limited early organic preservation.
Alabama, Arkansas, Georgia, Louisiana, and Mississippi	Southeastern preservational void, very high stone point concentrations.
Illinois, Indiana, and Iowa	Midwestern preservational void.
North Carolina and West Virginia	Appalachian preservational void or actually uninhabited by Early Paleoindians?

Six provinces of Canada are included in addition to the 33 American states: Alberta, British Columbia, Manitoba, Nova Scotia, Ontario, and Saskatchewan. Five of these provinces form a continuous block from the Pacific Ocean to the area north and east of the Great Lakes around Quebec. Coupled with Nova Scotia we see unglaciated Canada occupied very early, if faintly, across its entire span. Three states of Mexico are represented. To date Baja, Sonora, and Mexico are the only states of Mexico where preserved fauna and Early Paleoindian archaeological material have been found together. Figure 1:1 illustrates the broad distribution of these sites across the continent.

The importance of any given site is likely to wax and wane over time. Several sites included here will likely be removed from the discussion of extinct Pleistocene faunal utilization when the entire collections are examined for evidence of modification or as re-interpretations of site contexts warrant. Sites such as Jacob's Cavern and Potter Creek Cave are included despite misgivings about the materials, largely due to advances in archaeological techniques and analytical tools (Allison 1926; Putnam 1906). Use of modern research methods and tools make the age of the Jacob's Cavern drawing and the manufacturing process involved (stone or metal cuts) testable and answerable questions. Therefore some contentious sites are included precisely because long shelved, important research questions can be answered now or in the future.

This work represents only the first steps towards a formalized synthesis of Early Paleoindian data. It does not attempt to encompass all Clovis sites. Eventually a comprehensive online database will be created but much work is needed with the collections we have already gathered to make that a useful enterprise. Numerous additional sites are included throughout the text as they contribute to the discussion at hand.

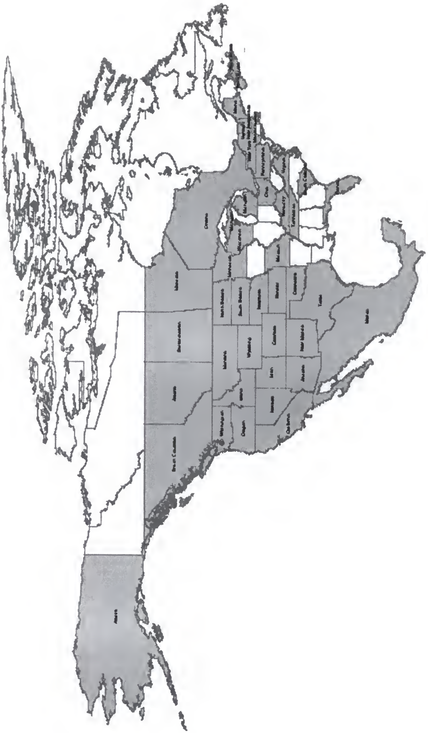

Figure 1:1 Geographic distribution of included sites across North America

CHAPTER 2
THE CLOVIS MENU AND THE CLOVIS DIET

Introduction

The Clovis diet extensively described in this chapter is a compilation of the published archaeological data regarding floral and faunal associations of Early Paleoindians and the species with which they were directly associated, and utilized or consumed. The appendices built for use in this chapter are designed to include every reasonable association of extinct animals and Early Paleoindian artifacts or unequivocal cultural modification of extinct taxa that are reported in the North American literature or have been recently discovered in Florida. Site inclusion is based on satisfying at least a portion of the criteria listed below, ordered from the most to least secure associations:

1- Presence of formal tools made from identifiable extinct animal elements.
2- Unequivocal cultural modification of bones: embedded points, real cuts, burns.
3- Co-occurrence of extinct fauna and diagnostic Paleoindian artifacts or features.
4- Co-occurrence of extinct fauna with non-diagnostic artifacts.
5- Extinct fauna lacking artifacts but articulation pattern believed human induced.

The first and second criteria do not necessarily require the presence of additional diagnostic artifacts for the cultural/faunal association to be considered unequivocal. Criteria three and four do require the presence of additional artifacts to demonstrate that the association is believable. Criterion five is the most equivocal because clear modifications and associations are both lacking. Context alone is cited to suggest that humans created the patterns observed at a site. Simple faunal presence in a Paleoindian site is the least conservative criterion for inclusion. Those items modified into formal bone, antler, and ivory tools represent the most conservative case (i.e., the association of Early Paleoindians and the animal is unequivocal). Site or assemblage size varies from a single element of one species up to hundreds of thousands of bones from numerous species.

Fragmentary formal bone or ivory tools constitute the smallest faunal assemblages and smallest sites. They are frequently simple isolated occurrences at underwater sites. Appendix 1 includes 19 sites in Florida that have produced no more than ivory tool fragments. However, the concomitant relationship of Early Paleoindians and the *Proboscidea* is considered absolute. The specific issue of possible old bone use is treated in detail in the next chapter. Another form of limited faunal assemblage is seen at sites such as Dent, CO. Dent has a plethora of individuals of a single species (mammoth n=15) and nothing else (Figgins 1933). The limited faunule of Dent probably has more to do with early archeological excavation and recovery techniques than preservation or cultural behavior. At the opposite end of the faunule spectrum are sites like Burnet Cave, Conkling Cavern, and Potter Creek Cave with more than 30 recovered species at each location, yet these sites held minimal evidence of cultural modification or direct association with the artifacts (see Appendix 2 for listings). These sites are included because of the useful direct utilization evidence that has been documented and to set the stage for further research to determine exactly what utilization evidence might be discerned (i. e., the site can become more useful or discarded based on further analysis).

Data extracted from the published archaeological literature are essentially used at face value. Rarely are minimum numbers of individual (MNI) animals published let alone numbers of individual specimens. When possible MNI are indicated in Appendix 2 but, more likely than not, no data were given by the original authors. This creates a weakness in the dataset for unless a taxon is specifically discussed in the primary literature, little more than its presence can be acknowledged. Its context and/or the nature of its modification would indicate a clear association with Early Paleoindians. This situation is not hopeless and the accumulated data in Appendix 2 indicate exactly what sites and what flora and fauna would benefit from additional examination and publication. At a minimum this systematic approach to the archaeological data provides means to keep track of our accumulated knowledge of the biota recovered at Early Paleoindian sites.

Notes Regarding Discovery Bias and Expected Modification Evidence

The discovery of large animals frequently leads to the discovery of associated artifacts. This occurred at: Blackwater Draw, Dent, Lubbock Lake, McLean, and Miami, to name a few (Grayson and Meltzer 2003; Meltzer 1993a). Kill sites bias our cultural interpretations in favor of the Big Game Hunting Tradition by being disproportionately visible. This observation is true but only addresses part of the problem. Other species, when found, are simply ignored in favor of the dramatic elephant data, even by those critical of the Big Game hunting model (Meltzer 2004). It should be no surprise that it is easier to find mammoths than the fossil remains of rabbits. This observation bears on site visibility and archaeological recovery but not on the prehistoric adaptation of Early Paleoindians. Proponents and critics alike cast other species aside when the Big Game Hunting idea is on the table. While it is necessary to address the preservational biases in favor of large game we should not confuse superior preservation and greater site visibility with the more important issues of specific cultural and subsistence adaptations.

The paucity of clear prehistoric modifications to most animal bones does not necessarily mean that individual was not butchered or utilized. Lack of clear modifications simply means that we cannot demonstrate an individual was utilized despite having been found associated with Early Paleoindian artifacts.

The floral remains from Early Paleoindian sites are typically preserved because they were carbonized in hearths. Even if consumed, most smaller vertebrates would exhibit very little direct modification evidence. There is no complicated butchery sequence and disarticulation pattern for rabbits. The best evidence of small animal utilization comes from post meal discard of elements that are fortuitously preserved in hearths.

Archaeologists must keep in mind that cut marks on bones are mistakes in the butchery process. Cut bone should be expected to occur infrequently on animals butchered by experienced hunters. Contact with bones will rapidly dull tools and introduce stone/bone chips into the meat. Gary Haynes cites the complete lack of cut marks on over 600 fully butchered African elephants culled in the 1980s (Haynes 1987:75). Cut marks appeared on the bones of only those elephants butchered by inexperienced hunters who killed with a much reduced periodicity (Haynes 1987). Groupings of parallel grooves are often cited as evidence of human butchery. If the cuts are truly parallel then they must have occurred in one stroke, not several. Shalow multiple grooves are far more likely to be from trampling than actual butchery (Fiorillo 1987).

Cut bones should be rare archaeologically. The issue of independent researchers ability to make individual assessments of cut marks (the closest we get to replication) further complicates the issue because it is rare that data regarding individual bones and their modifications are well published in full detail. Eileen Johnson's Lubbock Lake book is an exceptional case well worth emulating (Johnson 1987). More descriptive information on butchery marks, articulation and orientation needs to be included in publications. One particularly interesting topic that could then be examined is what are the preferences for axial versus appendicular elements. The summaries in Chapter 3 clearly indicate heavy selection of low meat utility elements for tool manufacture.

When looking at potential butchery markings on bones it is critical to orient the bones in their correct anatomical position to ensure that the location of the modification was accessible when the carcass was still intact (you may see modified surfaces that were not accessible when the animal was alive or only partially butchered). Patterns in the butchery process are tough to discern using cut marks and skeletal disarticulation data. Repeated use of low meat utility elements (tusks, teeth, antler, metatarsals, spineous processes, etc.) being selected for formal tools seems to be the best indication of hunting over scavenging because they could select any element from a scavenged animal. Valuable meat will not be wasted to get at deep bones of fresh kills.

The missing bison limb elements at Wilson-Leonard are interpreted to mean the animal was killed locally (Collins 1998:156). This raises the difficult question of what if the appendicular elements were intentionally salvaged to make bone tools and we are therefore misinterpreting what the skeletal disarticulation/articulation pattern really means. This issue is not likely resolvable with the archaeological data we recover and is mentioned more as a cautionary note than as real criticism.

Observed Potential and Observed Utilized Species in the Clovis Diet

All available published plant and animal remains from Early Paleoindian sites are listed in taxonomic order in Appendix 2. The Clovis diet section of this chapter presents summaries and discussion of selected categories of biota. Lower order taxonomic groupings with limited Early Paleoindian associations precede higher order individual species for which greater quantities of relevant date have been published. Throughout the text and in the appendices X denotes unequivocal evidence of utilization and X? indicates a very high probability that this occurrence was utilized. The symbol # typically indicates that a species was simply present at a given site. At a minimum all biota listed in Appendix 2 was found associated with Early Paleoindian artifacts. Those animals whose remains were fashioned into formal tools, clearly cut, burned or otherwise clearly modified are considered unequivocally utilized (X?) or very probably utilized (X?) based on the specific context and/or modifications published in the literature.

Flora From Early Paleoindian Sites

Identifiable plant remains have been recovered at 11 Early Paleoindian sites. Of the 25 species recovered the majority were found at Shawnee-Minisink, PA (N=10) and Lubbock Lake, TX (N=5). Eighteen plant and nut species have been found and 16 of those appear to have been consumed as food by Early Paleoindians.

Table 2:1 Early Paleoindian sites with floral remains

Site	State	Species N=	Species Utilized
Austin Cave	TN	1 hickory nuts	X probably food
Blackwater Draw bsw	NM	2 uid not food	X carbonized but unidentified
Gault/Wilson Leonard	TX	4 hackberry	X hackberry, walnut, plus 2 woods
Howard Gully	OK	1 wood only	X honey locust burned, not food
Israel River Complex	NH	1 waterlily	X waterlily charred seed
Levi Rockshelter	TX	1 hackberry	X burned seeds, in 2 levels
Lewisville	TX	1 hackberry	X burned seeds, in 10 hearths
Lubbock Lake	TX	5 net hackberry	X hackberry, +4 other, seeds food?
Page-Ladson	FL	1 squash seeds	Not X, 12,300 mastodon digesta
Shawnee-Minisink	PA	10, 9 food	X hackberry, +7 other food plants
Swan Point	AK	2, 0 food	X burned wood of willow & poplar
11 total sites	N=8	25 total species	21 utilized, 16 as food, +other uses?

The sixteen plants evidently eaten by Early Paleoindians are: hackberry, netleaf hackberry, bullrush, spikerush, gromwell, waterlily, amaranth, blackberry, buckbean, chenopod or goosefoot, ground cherry, grape, hawthorn plum, smartweed, seepweed, and hickory nuts. Most of the recovered parts are charred nuts or seeds found in hearths. The discovery context and modifications indicate these plants were eaten, taken as medicine, or otherwise utilized. Various portions of most of these plants are edible at different times of the year (*sensu* Yarnell 1964).

All but one of the plant species are singular occurrences. Hackberry seeds have been found at five sites (the second level at Levi Rockshelter is not counted twice). The *Celtis reticulata* from Lubbock Lake is a unique occurrence. The five other finds were of *Celtis occidentalis* known also as Common or American Hackberry. Hackberry seeds can occur in very dense quantities and preserve remarkably well. Often they are deposited as bird droppings. However, those under consideration here were mostly either burned and/or recovered from a hearth feature at Shawnee-Minisink (McNett 1985), Levi Rockshelter (n=2)(Alexander 1963), Lewisville (n=10)(Crook and Harris 1957), and

Gault (Collins et al. 1998). The numbers in parenthesis indicate the number of distinct occurrences at each site. The Lubbock Lake seeds were found in Stratum 1 of Area 2 but no further contextual or modification information is mentioned (Johnson 1987:32). The repeated utilization of this species may truly indicate an adaptational preference among Early Paleoindians. Shawnee-Minisink (PA) is distant enough from the group of Texas sites to suggest that Early Paleoindians utilized hackberries regularly upon encountering them (McNett 1985).

The gromwell and seepweed found at Lubbock Lake may represent Early Paleoindian behavior not previously documented or recognized. Both have been used as dyes prehistorically. Seepweed is also known as iodine bush and inkbush. Further, Johnson states that seepweed is "currently restricted to saline and alkaline soils" which are not present in Stratum 1 (Johnson 1987:32). Seepweed is not an immediately local species but does have an economically valuable reason for being brought home. There is little corroborating evidence in the form of modification or finished products but perhaps we are seeing a gathered resource that was introduced to the site by human collectors who used it as an ink or dye.

Because the most commonly preserved plant remains are seeds it is difficult to distinguish differences in seasonal availability. Essentially from July to October hackberries, goosefoot, acalypha, amaranth, blackberries, grapes, hawthorn plums, and winter cress could be available depending on local climatic conditions. The charred waterlily seeds from the Jefferson sites in New Hampshire might have been available slightly earlier in the year (June to September) (Boisvert and Puseman 2000).

All seven states with preserved floral remains contain good evidence that it was utilized. The wide range of geography exhibited in this group is perplexing. Clearly plant foods and wood were important resources to all people but tremendous gaps exist in archaeological coverage based on our current accumulated knowledge. Figure 2:1 shows a sweeping arc from New Mexico to New Hampshire. The addition of Alaska probably indicates the geographic gaps are related to preservation more than prehistoric subsistence behavior. The lack of preserved flora from the Desert Southwest and the Northern Great Plains is somewhat surprising considering the number of well excavated sites with good bone preservation that have been found in these area's. Methodological variance in earlier excavation techniques, coupled with the vagaries of preservation, easily account for the paucity of the very small plant remains recovered to date, particularly from sites excavated prior to ~1960. Flotation sampling of sediment samples would be of tremendous benefit.

A meaningful example of preservational biases in the archaeological record comes from Ventana Cave, AZ. The lower stratigraphic layers are wet or moist strata that contained preserved bits of charcoal that quickly disintegrated upon excavation (See Haury 1970:Figure 8, following page 54). This limited sample of floral remains is contrasted with the incredible diversity of plant artifacts found in the higher levels (Haury 1970:426). As dramatic as 16 consumed plant food species may appear, they pale when compared to what was probably originally there, both as food remains and as actual tools. The glimpse of the limited portion preserved since the Pleistocene and recently recovered tells only a small portion of the entire story.

Direct environmental reconstruction based on floral requirements and tolerances is not attempted here but the species diversity and sample size are large enough that the presence of nonlocal species may point to broader economic activities of Early Paleoindians. The Lubbock Lake seepweed may be the first indication of floral collecting behavior by Clovis people for something other than food (Johnson 1987). Additional floral data can be gleaned from extant pollen records from many Early Paleoindian sites. Palynology data are not included here as they are only able to directly inform the discussion of plants presence but not utilization at the various Paleoindian sites under consideration.

Clearly the 25 recovered floral species and 16 consumed species indicate a broad utilization of plants by Early Paleoindians across a large portion of North America. The behavioral implications of acquiring these plants are considered at length in Chapter 4 with additional gathered resources. The known Early Paleoindian utilization of plants was not an insignificant portion of their diet. This observation is tempered with the harsh realization that an additional 240 archaeological sites examined here with preserved bone have no plant remains. Lamentations aside, the sites listed in Table 2:1 and species listed in Appendix 2 greatly increase our sample size of Early Paleoindian dietary plant use. The sixteen plant species utilized do not demonstrate dependence wholly on plant food but rather an important component of a generalist utilization of numerous available resources. Poor plant preservation should not be taken as evidence of a restricted role in the Early Paleoindian subsistence adaptation. Finally, it should be noted that no recognized extinctions occurred in the 25 species from this kingdom at the end of the Pleistocene.

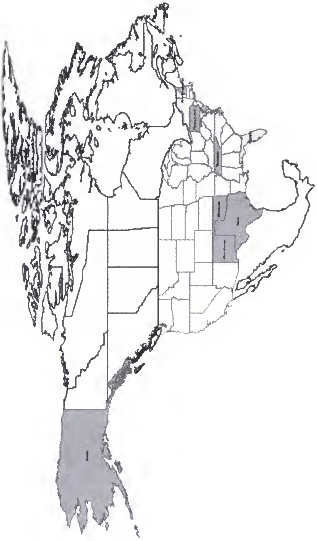

Figure 2:1 Flora in Early Paleoindian sites and utilization distribution

Invertebrate Fauna From Early Paleoindian Sites

Invertebrate faunal remains have been recovered from five Early Paleoindian sites: Horn Rock Shelter #2, Levi Rock Shelter, Lewisville, Wasden/Owl Cave, and Wilson-Leonard. Wasden, Idaho is the only site not in Texas and may in fact be a Folsom site that will be culled from this sample in the future. This specific issue is addressed later in this chapter under *Mammuthus columbi* and in Chapter 4 under Folsom Faunules.The discovery of burned mud dauber nests at Lewisville and Wilson-Leonard are doubly perplexing as these are the only two open air sites in this sample and both contain the only utilized insect yet found at an Early Paleoindian site. Charred pupae were found in hearth #2 at Lewisville, TX (Crook and Harris 1957). The pupae may indicate wasps were a food source and not simply a pest to be destroyed. The importance of examining the mud dauber nest remains cannot be overstated, particularly if any reconstruction is possible. Because these are open air sites the nests may provide our first glimpse of a Paleoindian structure or tent which the wasps colonized if there is meaningful form imprinted in the nest structure. Conversely, if the burned nests were not attached to a human structure then wasps should be classified as yet another gathered resource eaten by Clovis people as they were carried to the sites.

A minimum of ten mollusk species have been recovered from Horn Rock Shelter #2, Levi Rock Shelter, Lewisville, and the enigmatic Wasden/Owl Cave. A single gastropod, *Vallonia sp.*, is reported from the Folsom layer of Wasden but no indication of consumption by humans is suggested as they are extant within the cave today (Miller 1982:92; 1989). The remaining species were all either burned and/or found in a hearth. Identification of specific taxa has only been published for Lewisville, TX (Crook and

Harris 1957). Mussel and gastropod shells recovered in the Under Clovis cultural level at Levi Rock Shelter were probably burned (Alexander 1963; 1982). Nine species of terrestrial gastropods were reported from a hearth in Stratum 3 of Horn Rock Shelter #2 but no species list has been published (Redder 1985). The underreporting of these two sites severely hinders analysis by other researchers. This problem is particularly frustrating considering the potential of these data to directly contribute to a discussion of Clovis diet and their subsistence economy.

The three mussel species and five gastropod species found in the hearths of Lewisville, TX are specifically identified in Appendix 2 (Crook and Harris 1957). The mussel *Fusconia undata* was found burned in hearths 1 and 16 (Crook and Harris 1957). The seven other shelled species were found burned in a minimum of three hearths each. Unequivocal, repeated utilization of seven species of mollusks at one site is the densest concentration of evidence for aquatic resource reliance by Clovis people yet reported (Crook and Harris 1957; 1958).

A rather restricted geographic distribution of Early Paleoindian invertebrate remains is indicated if the Folsom age Wasden/Owl Cave, Idaho site is excluded (Miller 1982). While it is possible to suggest that four sites in Texas represent a cluster of patterned behavior distinct from Paleoindian behavior elsewhere, this assertion is not demonstrable at this time as will be seen in the mammal section. That said there is clearly a cluster of sites in Texas and repeated utilization of numerous species suggest normal or regular exploitation of mussels, various gastropods, and possibly wasps. The numerous occurrences of each consumed species at Lewisville suggest mollusks were a regular contribution to the Clovis diet. All of the utilized invertebrates at Early Paleoindian sites should be considered gathered resources.

Levi Rockshelter, Lewisville, and Wilson-Leonard have preserved remains of both plants and invertebrates clearly utilized by Early Paleoindians (Alexander 1982; Collins et al. 1998; Crook and Harris 1957). The remainder of this chapter will repeatedly demonstrate that these Texas sites also contain the full suite of vertebrate fauna listed in Appendix 2. The critical distinction between superior preservation and archaeological recovery and the real subsistence adaptation must be vigilantly maintained. At this point the dietary pattern seen from sites in Texas should not be considered aberrant. Instead, it may offer an unusually full insight into the importance of plants and invertebrates within the Clovis subsistence adaptation.

No direct environmental reconstruction is attempted here from the invertebrate remains found at these five Early Paleoindian sites. However, it is important to note that of the ten taxa identified to at least genus level no extinctions are observed among a very environmentally sensitive group of animals.

Fish Remains From Early Paleoindian Sites

Fish bones or scales have been recovered from 13 Early Paleoindian sites in nine states across North America. Table 2:2 lists the sites and numbers of species utilized. Table 2:3 lists the identified species and their frequency. The complete data set is given in Appendix 2.

Only two utilized and two probably utilized species of fish have been identified from the observed potential subsistence base of Early Paleoindians (see Table 2:3 below).

Table 2:2 Early Paleoindian sites with fish remains

Site	State	Species N=	Species Utilized
Aubrey	TX	7 or more	X burned but species not listed
Broken Mammoth	AK	1.	Salmon in Cultural Zone iv, utilized?
Dutchess Quarry Cave3	NY	1 or more	Uid. fish, possibly Cave #8 also
East Wenatchee	WA	1	X salmon blood on points
Horn Rockshelter #2	TX	2	X? channel catfish, freshwater drum
Lange-Ferguson	SD	1	Minnows, no further data
Lewisville	TX	1 or more	X hearth 1 & 6, minimal use data
Lubbock Lake	TX	6	6 species, but simply present?
Page-Ladson	FL	Multiple	Underwater site, to be determined
Shawnee-Minisink	PA	1 or more	X salmon burned in hearth
Sloth Hole	FL	Multiple	Underwater site, to be determined
Tule Lake	CA	1 or more	X burned in hearth, species uid.
Wasden/Owl Cave	ID	2	2 minnow, sucker simply present?
13 total	N=9	N=15+X	5 utilized occurrences 1 probable

Certainly, additional species would be added to this list if the material from Lewisville, Aubrey, Dutchess Quarry, Shawnee-Minisink, and Tule Lake were given additional examination. Several of the underwater sites in Florida contain fish but further research is needed to determine if any of the fish were indeed consumed.

The geographic range represented by the nine states with fish remains in Early Paleoindian archaeological sites is truly continental (Figure 2:2). Only the two species of salmon and the identified minnows were not recovered in Texas. Again, Texas appears to have widespread superior preservation of organic remains in early archaeological sites. However, the utilized fish remains are not limited to Texas as in the invertebrate situation. Fish were clearly available at numerous Clovis sites across the continental United States. The clear utilization of fish covers much of the same ground. This suggests that when available and/or encountered, fish were a regular part of the Early Paleoindian Clovis diet. This is not a surprise to the generalist subsistence strategy advocated here. The widespread utilization of fish, at least some of the time, is not expected based on the portion of the specialized technological adaptation we have been able to identify archaeologically to date. The lack of recognized fishing technology is addressed in Chapter 4.

The individual species of fish identified to date are summarized in Table 2:3. Fifteen groupings are recognized here but this under represents what has already been recovered. Lewisville and Tule Lake deserve the closest scrutiny as the unidentified fish remains are burned (Crook and Harris 1957; Haynes et al. 1967).

The fish dataset is larger than either the plant or invertebrate sample. However, there is a very limited amount of direct evidence of utilization. Salmon at East Wenatchee, WA and Shawnee-Minisink, PA are the only identified species that were clearly utilized (Gramly 1993; McNett 1985). Clearly utilized, but unidentified fish, were recovered at Aubrey, TX (Ferring 2001); Lewisville, TX (Crook and Harris 1957); Shawnee-Minisink, PA (McNett 1985); and Tule Lake, CA (Haynes et al. 1967). Channel catfish and freshwater drum were probably utilized by people living at Horn Rockshelter #2, TX. (Redder 1985).

In total there are five sites where fish were clearly eaten and a sixth where they were probably eaten. Fish were recovered 25 times from nine sites. Shawnee-Minisink had two occurrences of utilized fish species giving a total of eight utilization occurrences at five sites (McNett 1985). The geographic distribution of the sites in Washington, California, Texas, and Pennsylvania essentially recapitulates the distribution of all Early Paleoindian sites with preserved fish remains. This seems to indicate that if fish are present at an Early Paleoindian site it is because they were eaten.

Table 2:3 Species of fish from Early Paleoindian sites.

Species	Site #	Comments
Pisces/Osteichthyes- Uid.	5	Only identified as fish, clearly utilized in 4 sites
Cyprinidae sp.- minnow	2	Lange-Ferguson & Wasden- but not utilized
Salmonodies- nfd	2	X East Wenatchee, but ? Broken Mammoth
Oncorhynchus sp.- salmon	1	X Shawnee-Minisink, found in hearth
Lepisosteus atractosteos-gar	2	Aubrey & Lubbock Lake- but not utilized?
Amia calva- bowfin	1	Aubrey- but not utilized?
Catastomidae sp. sucker	2	Aubrey & Wasden- but not utilized?
Carpoides cyprinis-quillback	1	Lubbock Lake- but not utilized? Sucker
Ictalurus sp.- catfish	1	Aubrey- but not utilized?
Ictalurus melas-black bullhead	1	Lubbock Lake- but not utilized?
Ictalurus punctatus-channel cat	2	X? Horn Rockshelter #2- ? Lubbock Lake
Ictalurus sp. ameiurus-bullhead	1	Lubbock Lake, but not utilized?
Centrarchidae uid- sunfish/bass	1	Aubrey- but not utilized
Lepomis cyanellus-grn sunfish	1	Lubbock Lake- but not utilized?
Aplodinotus grunniens-fr drum	2	X? Horn Rockshelter #2- ? Aubrey, freshwater
15+? Species found	13	2 Utilized, 2 Probably Utilized, others unknown

The remaining fish occurrences are either equivocal or simply natural (i.e., not demonstrably present because of human subsistence activities). Page/Ladson and Sloth Hole in the Aucilla River of North Florida fall into this last category. At each site numerous species of fish have been recovered from *in situ* Late Pleistocene artifact bearing sediments at the bottom of the river. However, as the underwater context of deposition and the lack of recognized cultural modifications leave no indication that these fish were utilized by humans they can be included only for their presence and availability to Early Paleoindians who clearly consumed fish at many other places across North America.

Fish are the third environmentally sensitive biotic group considered which does not have any recognized extinctions at the end of the Pleistocene. Individual species of fish can be sensitive to changes in silt load, water temperature, sunlight, salinity, and other micro environmental change. All species included here are freshwater fish.

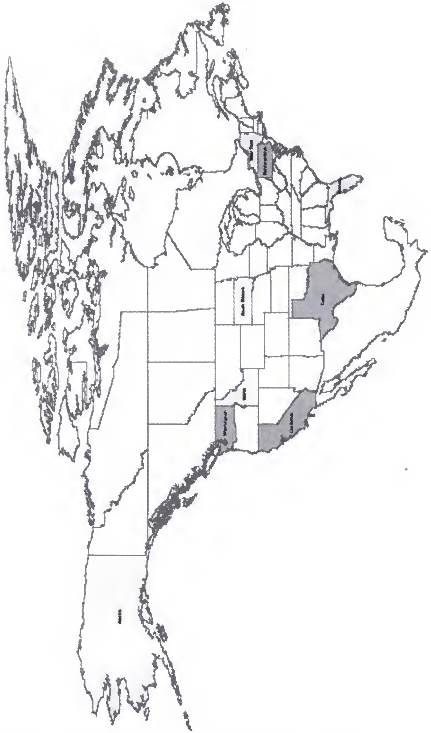

Figure 2:2 Fish in Early Paleoindian sites and utilization distribution

Amphibian Remains From Early Paleoindian Sites

The diversity of amphibian remains from Early Paleoindian sites is surprisingly robust. 17 individual species have been identified with an additional 10 occurrences reported only as salamander (1), toad (3), frog or toad (1), frog (4), and frog or lizard (1). Nearly 30 species have been recovered from Early Paleoindian contexts at 17 sites in 11 states. The sites and number of species present at each site are listed in Table 2:4.

Table 2:4 Early Paleoindian sites with amphibians present

Site	State	Species N=	Species Present and/or Utilized
Aubrey	TX	2	Salamander, toad or frog present
Horn Rockshelter #2	TX	1 rana sp.	X? Strata 4 frog cooked?
Lewisville	TX	1 frog or lizard	X hearth 6, burned leg (frog)
Lubbock Lake	TX	8 Id'ed species	1 salamander 4 toads 3 frogs present
Blackwater Draw bsw	NM	1	Northern leopard frog present
Sandia Cave san/fol?	NM	2 uid	Salamander & toad present- no level
Lange-Ferguson	SD	2 Id'ed	Salamander N. leopard frog present
Domebo	OK	2	Cricket & Nor. Leopard frog present
Mill Iron- Goshen	MT	1 frog	Rana sp. simply present
Potter Creek Cave	CA	1	Western toad present
Wasden/Owl cave fols?	ID	1 toad	Great Basin spadefoot w/Folsom?
Sheriden Cave	OH	6, 5 species id	Mole salamander, toad sp. 4 frog sp.
Shelton Mastodon	MI	2 frogs	Green & bullfrog present
Coats-Hines	TN	1 frog	Rana sp. present
Hornsby Springs	FL	1	Southern toad present
Wakulla Springs	FL	1	Amphiuma means present
Warm Mineral Springs	FL	1 uid frog	Zone 3 frog too new probably
17 total	N=11	N=17+up to 10	1 utilized occurrence & 1 probable

The eleven states represented in Table 2:4 are highlighted in Figure 2:3. The amphibian coverage is the densest yet presented but once again only Texas has any indication that they were consumed. The single burned leg bone of a frog (possibly lizard) from Hearth 6 at Lewisville is the only clear evidence of amphibian utilization by Early Paleoindians and even that might actually be a reptile (Crook and Harris 1957). The frog remains from Strata 4 of Horn Rockshelter #2 could be burned but it is unclear

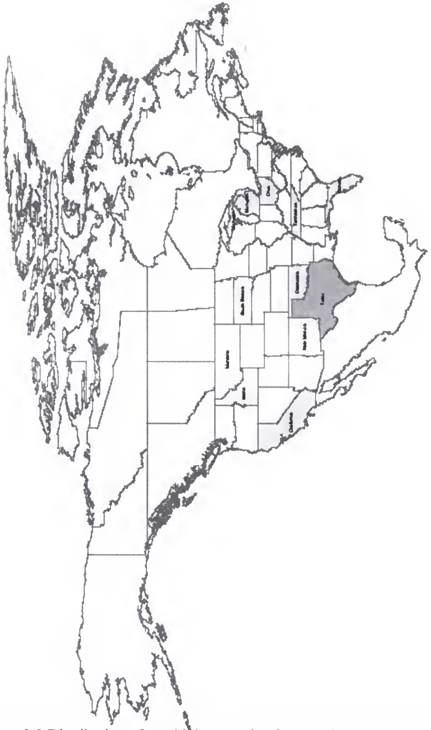

Figure 2:3 Distribution of amphibian remains from Early Paleoindian contexts

from the published literature (Alexander 1985). If indeed both are utilized animals then frogs would have to be considered the preferred amphibian on the Clovis menu, until our dataset improves.

The seven sites in New Mexico (2), Oklahoma (1), and Texas (4) form a fairly dense cluster of preserved remains. Their importance is particularly notable when the five species from Blackwater Draw, Sandia Cave, and Domebo are added to the 13 species reported from Aubrey, Horn Rockshelter #2, Lewisville, and Lubbock Lake. These three states include 18 of the 35 occurrences of amphibians in Early Paleoindian sites from just 7 of the 17 sites.

Table 2:5 Amphibian species from Early Paleoindian sites.

Species	Site #	Comments
Salamander uid.	1	Sandia Cave, no level given, simply present
Urodela sp.- salamander	2	Lange-Ferguson, simply present
Caudata uid.-salamander	1	Aubrey, simply present
Ambystoma sp-mole salam.	1	Sheriden Cave, simply present
Ambystoma tigrinum	1	Lubbock Lake, simply present, common salam.
Amphiuma means	1	Wakulla Springs, three toed amphiuma
Toad	3	Lubbock Lake, Sheriden & Sandia Cave-present
Scaphiopus bombifrons	1	Lubbock Lake, plains spadefoot toad, present
Scaphiopus intermontanus	1	Wasden/Owl Cave, Great Basin spadefoot, pres
Bufo terrestris-southern toad	1	Hornsby Springs, simply present
Bufo cognates-plains toad	1	Lubbock Lake, simply present
Bufo woodhouse bexarensis	1	Lubbock Lake, Friesenhahn cavetoad, present
Bufo boreas- western toad	1	Potter Creek Cave, simply present
Anura- toad or frog	1	Aubrey, simply present
Rana sp. uid. Frog	4	X? Horn RS#2. +Mill Iron, Coates-Hines, WMSpr
Acris crepitans-cricket frog	2	Domebo & Lubbock Lake, simply present
Rana catesbeiana- bullfrog	3	Shelton, Sheriden Cave, Lubbock Lake, present
Rana clamitans- green frog	2	Shelton mastodon, Sheriden Cave, present
Rana pipiens-N leopard frog	5	BWD, Domebo, LL, Sheriden, Lange-F-present
Rana sylvatica- wood frog	1	Sheriden Cave, simply present
Rana palustris- pickeral frog	1	Lubbock Lake, simply present
Frog or lizard uid.	1	X burned frog leg(?) in Lewisville hearth 6
17+up to 10? Species found	17	1 Utilized, 1 Probably Utilized, #31 =33 occur.

The 33 occurrences of amphibians at 17 sites have failed to produce more than minimal evidence of utilization of this group by Early Paleoindians. The 27 possible species recovered from these sites clearly demonstrate that amphibians were available to Clovis people but the collected evidence indicates they were infrequently utilized if ever eaten. No extinctions occurred within this group of amphibians.

Reptile Remains From Early Paleoindian Sites

The larger reptilian sample size necessitates division into smaller, more manageable units. Turtles and tortoises, lizards, snakes, and alligators are considered in separate sections for each order within the *Reptilia*. All species occurrences and utilization evidence are briefly summarized after each order has been discussed. Figure 2:4 shows all 14 states with reptiles present in Early Paleoindian contexts. Following the alligator section, Figure 2:5 shows the distribution of those reptiles believed to have been consumed by people at the end of the Pleistocene. The states with utilized reptiles are considerably restricted from those with reptiles simply present (6 of 14) as Map 2:5 shows. The sample size of the total reptile data is fairly large (137 occurrences of 69 species). However, the direct evidence of utilization is rather minimal for this large sample (29 of 137 or 21%). Detailed comparison of all biotic groups following the mammal section of this chapter will examine utilization ratios and the implications about human behavior they exhibit.

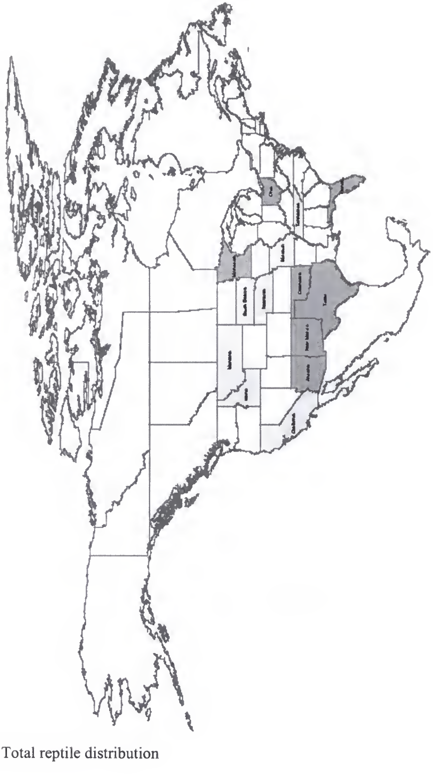

Figure 2:4 Total reptile distribution

Turtles and tortoises from Early Paleoindian sites

The group of turtles and tortoises (the Order Testudines) include the first recognized extinct Pleistocene fauna considered thus far. The large land tortoises and the Carolina box turtle (*Terepene carolina putnami*) became extinct at the end of the Pleistocene and each has clear evidence of utilization by Early Paleoindians. The 30 species listed below occur a total of 66 times at the 24 archaeological sites in Table 2:6.

The 24 sites in Table 2:6 are from 10 of the 14 states where Early Paleoindian artifacts are associated with reptiles. Seven of the states are generally southern but three (Minnesota, Nebraska, and Ohio) are surprisingly farther north. All of the turtle species recovered from Sheriden Cave (Tankersley 1997:82) and the Itasca Bison Kill (Shay 1971:30) are extant. The occurrence of the extinct large land tortoise (*Geochelone equicomes*) in Nebraska at the Angus site is both a range expansion and direct evidence of a more equitable climate at some point late in the Pleistocene on the Great Plains (Harris 1985). Tortoises must live below the frost line. The extant tortoise *Gopherus agassizi*, found at Lewisville and Conkling Cave, is frost sensitive as well (Moodie and Van Devender 1979:202).

The remains of the extinct tortoise (*Geochelone crassiscutata*) from Little Salt Springs are widely reported to have been found with a wooded stake driven through the. carapace and the carapace is supposed to be burned (Clausen et al. 1979). It cannot be repeated with enough emphasis that the wooden stake is 1400 years younger than the tortoise (Haynes 2002:46). Further, when the carapace was reconstructed at the Florida Museum of Natural History it was clear that the supposed burning was oxidation caused by exposure within the water column (Dunbar and Webb 1996:351). "Burned" pieces

Table 2:6 Early Paleoindian sites with turtle or tortoise remains

Site Name	State	Species N=	Presence and Utilization
Aubrey	TX	5	X Musk turtle X turtle uid. +3 present
Bee Co Buckner Ranch	TX	2 extinct	Carolina box Geochelone wilsoni pres.
Horn Rockshelter #2	TX	1 extinct	X? Geochelone or Gopherus sp.
Kincaid Rockshelter	TX	2	Carolina box, com slider, present
Levi Rockshelter	TX	1	X? Uid turtles, probably burned?
Lewisville	TX	6, 1 extinct	3X, 1X?,#2. Geochelone extinct
Lubbock Lake	TX	8, 3 extinct	1X? Ex. Carolina box, 7 simply present
Wilson-Leonard	TX	2	Musk & uid turtles, simply present
Blackwater Draw GS	NM	1	Large box turtle, simply present
Blackwater Draw bsw	NM	3, 2 extinct	X ex. Carolina box stacked, Gw+T orn.
Burnet Cave	NM	2, 1 extinct	Extinct carolina box+uid turtle present
Conkling Cave	NM	1	Gopherus agassizii, simply present
Fowler Bridge Mast.	FL	1 extinct	X drilled Geochelone crassiscutata
Little Salt Spring	FL	5, 1 extinct	X? G. c. NOT burned, older stake + #4
Sloth Hole	FL	1 extinct	Geochelone crassiscutata, present
Warm Mineral Springs	FL	1	Unidentified turtle, simply present
Domebo	OK	3, 2 extinct	Geo. wilsoni ex carolina box+1 present
Howard Gully	OK	2, 1 extinct	X? Geo cra burned? +uid turtles present
Coates-Hines	TN	2	Painted & uid turtles present w/Ma
Itasca Bison Kill	MN	1	X? painted pond slider. Too new?
Angus	NE	4, 1 extinct	Geo equicomes +3 sp. simply present
Lehner Ranch	AZ	1	X unidentified tortoise burned
Sheriden Cave	OH	8	X snapping turtle cut, 7 simply present
Potter Creek Cave	CA	2	Pond turtle, uid tortoise, simply present
24 Sites (BWD=2)	10	31	9X, 7X?, #50 present= 66 occurrences

articulated with unburned pieces or pieces "burned" on the interior. Essentially whichever side was up and exposed became darkened by exposure to oxygen and tannins in the water. This tortoise is still counted as possibly or probably utilized (X?) because the presence of the stake stabbed into the area of the body cavity is not easily explained without human involvement (Clausen et al. 1979).

Utilization of the giant land tortoise is unequivocal from the Fowler Bridge site in the Hillsborough River, FL. One section of the carapace has three overlapping channels gouged into an edge (Palmer 1981:132). The markings appear to be from prying the shell apart but the orientation of the specimen is not clear (Palmer 1981:133 Fig.12).

Table 2:7 Species of turtles and tortoises from Early Paleoindian sites

Species	# of Sites	Comments
Uid turtles- Chelonia, Testudinata	7	Multiple species represented
Painted pond slider	1	Itasca, may be too new
Mud/musk turtle- Kinosternon sp.	1	X burned at Aubrey, TX
Yellow mud turtle- K. flavescens	1	Lubbock Lake, simply present
Musk turtle- Sternotherus odoratus	1	Sheriden Cave, simply present
Musk turtle- S. sp.	1	Wilson-Leonard, simply present
Snapping turtle- Chelydra serpentina	3	X Sheriden Cave cut vert +2 present
Pond turtle- Chrysemys/Trachemys	1	Aubrey, simply present
Painted turtle- Chrysemys picta	3	Angus Sheriden Coats-Hines-present
Marsh/pond turtles- Clemmys sp.	1	Potter Creek Cave, simply present
Blanding's turtle- Emydoidea bland.	1	Sheriden Cave, simply present
Map turtle- Graptemys sp.	1	Sheriden Cave, simply present
Cooter/red bellies- Pseudemys sp.	1	Sheriden Cave, simply present
Fl red belly- Pseudemys nelsoni	1	Little Salt Spring, simply present
Common cooter- Pseud floridana	1	Little Salt Spring, simply present
Carolina box tur.-Terrapene carolina	5	3 TX, LSSpring, Domebo, present
Carolina box turtle-Terrapene c. put.	5 Extinct	X BWD bsw stack, 4 simply present
Ornate box turtle- Terrapene ornatus	1	BWD bsw, simply present
Large box turtle- T. canaliculata	2	X Lewisville, present BWD Greysand
Common slider- Trachemys scripta	3	Angus-Lub. Lake-Kincaid, present
Softshell turtle- Trionyx sp.	2	Aubrey Lubbock Lake simply present
Uid tortoise	2	X Lehner burned, Potter CC present
Tortoise- Testudo sp. large	1	X Lewisville Hearth 2
Tortoise- Testudo sp. small	1	X? Lewisville Hearth 2
Land tortoise-Gopherus/Geochelone	1 Extinct	X? Horn RS #2 arranged bones?
Desert tortoise- Gopherus agassizii	2	X Lewisville Hearth 0 Conkling Cave
Gopher tortoise- G. polyphemus	1	Little Salt Spring, simply present
Large tortoise- Geochelone sp.	2 Extinct	Lewisville, Lubbock Lake, =G.c.
L. tort. Geochelone crassiscutata	4 Extinct	X Fowler Bridge, 2X? LSS, H.G.+1
Western m/l tortoise-G. equicomes	1 Extinct	Angus, simply present
Western sm tort-Geochelone wilsoni	4	BWD bsw, Bee Co, LL, Domebo
Softshell turtle-Apolone sp.	2	Sheriden Cave Lubbock Lake present
Spiny softshell turtle-A. spinifera	1	Sheriden Cave, simply present
33 listed=30+species	24(2bwd)	9X, 7X?, #50 present=66 occurrences

The complete list of turtle and tortoise species recovered from Early Paleoindian sites given in Table 2:7 covers a wide range of preferred ecological habitats in 10 states across the continent. No area is clearly excluded but the coverage is sporadic.

In addition to the extinct Carolina box turtle an extinct land tortoise of interest is *Geochelone wilsoni*. It is only known from six localities, four of which are archaeological sites (Moodie and Van Devender 1979:200). Three are Clovis (Blackwater Draw bsw, Domebo, and Lubbock Lake) and the final occurrence is from the Folsom/Midland Level at Buckner Ranch, Bee County, Texas, which is above the Clovis Level. The herpetofauna survive the Pleistocene glacial cycles essentially intact (3 species extinct). Mammals and birds suffer greatly at the end of the last glacial retreat (197 species/46 genera and 19 genera, respectively) (Holman 1991:231). The lower vertebrates should be more environmentally sensitive yet rearrange themselves less and have fewer extinctions. Various species of two turtle genera (*Geochelone* and *Gopherus*) (Holman 1991) are practically eradicated at the end of the Pleistocene. Potential causes and implications are fully articulated in the extinction section of this chapter. Here it is important to simply recognize that a very limited portion of the Testudines, with evidence of human exploitation, die off. N. B. *Geochelone* now is considered *Hesperotestudo*.

Lizard remains from Early Paleoindian sites

To judge from available data the least desirable portion of the immediately available Late Pleistocene fauna to Early Paleoindians appears to have been lizards. Nine species occur twelve times at fives sites. There is no evidence of lizards being eaten or their remains being modified in any way by Clovis people. Caution is urged to not overemphasize this absence of evidence. Expected context and modifications are essentially limited to charred bones being preserved in a hearth feature. Crushing or grinding of small vertebrates would render their skeletal remains unidentifiable. However, lizards and other small creatures have been found with sufficient frequency to suggest lizards were not a preferred food source.

Table 2:8 Species of lizards from Early Paleoindian sites

Species	# of sites	Comments
Uid. Lizards (all multiple per site)	3	Aubrey, Sandia, Horn RS#2- present
Horned fence lizard- Scelporus sp.	1	Wasden/Owl Cave- Folsom age?
Leopard fence lizard- Scelporus sp.	1	Wasden/Owl Cave- Folsom age?
Sagebrush f. lizard- Scelporus sp.	1	Wasden/Owl Cave- Folsom age?
Western f. l. Scelporus occidentalis	1	Wasden/Owl Cave- Folsom age?
Spiny lizard sp?- Scelporus sp.	1	Burnet Cave- no further data
Collared lizard- Crotaphytus collaris	1	Burnet Cave- no further data
Short horned l.Phrynosoma douglasii	1	Burnet Cave- no further data
Texas horned lizard-P. cornutum	1	Burnet Cave- no further data
Whiptail/racerunner-Cnemidophorus	1	Burnet Cave- Listed only in Holman
9 species + more now unidentified	5	All 12 occurrences simple presence

Snake remains from Early Paleoindian sites

There are 29 species of snakes that have been recovered from 19 sites in 11 states. The list of sites provided in Table 2:9 indicates a widespread and diverse fauna that has rather limited evidence of utilization by Early Paleoindians. The most unequivocal and surprising inclusion is the garter snake remains found in a hearth at Lehner Ranch, AZ (Haury 1959). Additional solid evidence of snake utilization from Clovis sites comes from the constricting snake remains found in three loci at Aubrey, TX (Ferring 2001) and by the multiple occurrences of burned viper and constricting snakes at Lewisville, TX (Crook and Harris 1957). The unidentified reptile eggs found in a hearth at Lewisville are counted here because there is so much other evidence of snake cooking across the site that this seems like a reasonable place to include them. Two additional species of snakes appear to have been burned at both Lewisville and Levi Rockshelter.

Table 2:9 Early Paleoindian sites with snake remains

Site	State	Species #	Presence and Utilization
Aubrey	TX	4	3X 3 burned: Uid, viperous,constrict+1
Horn Rockshelter #2	TX	1	Uid in strata 4, no further data
Levi Rockshelter	TX	2	2X big & little Uid likely burned?
Lewisville	TX	6	4X, 2X? eggs sp?+3/2? burns+ hearths
Lubbock Lake	TX	12	No modifications indicated
Wilson-Leonard	TX	2	In bone bed above Clovis layer
Blackwater Draw brn sand	NM	5	No modifications indicated
Burnet Cave	NM	1	Uid snake simply present
Conkling Cave	NM	4	Identified but no artifacts, human bone
Hornsby Springs	FL	6	Identified- present, E diamondback
Little Salt Spring	FL	1	Eastern diamondback rattlesnake pres.
Wakulla Spring	FL	2	Garter snake? & watersnake present
Domebo	OK	2	E ribbon snake & pit viper, present
Kimmswick	MO	1	Uid. snake, simply present
Lange-Ferguson	SD	2	Uid snake & watersnake simply present
Lehner Ranch	AZ	1	X burned garter snake in hearth
Mill Iron- Goshen	MT	1	Gopher snake- Not X, present
Potter Creek Cave	CA	1	Western rattlesnake, simply present
Sheriden Cave	OH	3	Plainbelly water, water, garter-present
19 sites= 3X, 2X? N=4	11	29 total+	8X, 4X?, #44 present= 56 occurrences

The three sites with clear evidence of snake modification, and presumably use, are Aubrey, Lehner, and Lewisville (Crook and Harris 1958; Ferring 2001; Haury et al. 1959). Lewisville is counted again, with Levi Rockshelter, as each has two different species that probably were utilized by Clovis people. These four sites contain 12 occurrences of utilized snake remains from the total of 56 observed occurrences. The frequency of use when present (12 of 56 or 21%) mirrors the percentage of total snake species and species utilized (6 of 29 or 21%). This seems to indicate there is no real difference between the frequency and diversity of snake utilization. Snakes were not a highly selected or ranked resource but were used with some regularity when available, as can be seen in Tables 2:9 and 2:10. The species table demonstrates a wide range of available snakes from known Early Paleoindian contexts.

Table 2:10 Snakes species from Early Paleoindian sites

Species	# of Sites	Comments
Reptile eggs (turtle possible)	1	X Lewisville, eggs in hearth
Unidentified snake or snakes	8	X Aubrey, 2X? Levi Rs, 5 present
Viperous snake-Viperidae	2	2X Lewisville and Aubrey, TX
Constricting snake- Colubrid A	1	X Lewisville mni5 Hearths 6 &13
Constricting snake- Colubrid B	1	X Lewisville Hearth 6 burned vertebrae
Constricting- Colubridae sp.	2	X Aubrey- 3 loci, Wilson-Leonard pres.
Trans-Pecos rat-Bogartophis sub.	1	Conkling Cave, simply present
Worm snake Carphophis amoenis	1	Lubbock Lake, simply present
Racer- Coluber constrictor	1	Conkling Cave, simply present
Corn snake, Elephe guttata	1	Lubbock Lake, simply present
Mud snake, Farancia abacura	1	Hornsby Springs, simply present
W. hook nosed-Gyalopion canum	1	Lubbock Lake, simply present
W. hog nosed- Heterodon nasicus	2	BWD bsw, Lubbock Lake, present
Milk -Lampropeltis triangulum	1	Lubbock Lake, simply present
King/Milk- L. cf. doliata	1	BWD bsw, simply present
Grass snake- Drymarchon corias?	1	X? Lewisville Hearth 13
Watersnake Uid.	1	Lange-Ferguson, simply present
Watersnake Uid- Nerodia sp.	5	X? Lewisville, 4 others simply present
Plainbelly water-N. erthrogaster	1	Sheriden Cave, simply present
S. water snake- Nerodia fasciata	1	Hornsby Springs, simply present
Brown water snake- N taxispilota	1	Hornsby Springs, simply present
Gopher- Pituophis melanoleucus	2	Conkling Cave, Mill Iron-Goshen, pres.
Patch nosed snake- Salvadora sp.	1	Lubbock Lake, simply present
Ground – Sonora semiannulata	2	BWD bsw, Lubbock Lake, present
Garter snake? Thamnophis sirtalis	2 w/ T. s.	Sheriden Cave, Wakulla Spring, present
Garter snake- Thamnophis sirtalis	4	X Lehner hearth, 3 simply present
E. ribbon snake- T. sauritus	2	BWD bsw, Domebo, simply present
Lined -Tropidoclonion lineatum	1	Lubbock Lake, simply present
Rough earth - Virginia striatula	1	Lubbock Lake, simply present
Pit viper- Crotalus sp.	1	Domebo, simply present
E diamondback- C. adamanteus	2	Hornsby & Little Salt Spring present
W diamondback- Crotalus atrox	3	Potter&Conkling Cave Lubbock present
29 species+ multiple others likely	19 sites	8X, 4X?, #44 present = 56 occurrences

Even dangerous snake types were utilized by Early Paleoindians, as there are several viperous snakes and rattlesnakes that have been found at numerous archaeological sites. Some of the better evidence for snake use from Aubrey and Lewisville includes modified remains of unidentified viperous snakes (Crook and Harris 1957; Ferring 2001).

Superior preservation of organic remains in northeastern Texas certainly leaves the impression that Clovis people outside of Dallas behaved somewhat differently than Clovis people elsewhere. A full 75% (9 of 12 occurrences) of the utilized snake evidence in the archaeological literature is from Aubrey and Lewisville, TX (Crook and Harris 1957; 1958; Ferring 2001). This is a very small sample but it is not insignificant. These sites are less than 15 miles apart and may well have been occupied by the same individuals. A consistent pattern of local subsistence behavior may be what is shown here rather than just fortuitous preservation. Many of the other sites with snake remains were dug quite some time ago and the faunal analysis employed today might drastically change this picture with only a few hours examination. Burnet Cave, NM, Conkling Cave, NM, and Potter Creek Cave, CA would all benefit from detailed faunal description and analysis.

Alligator remains from Early Paleoindian sites

Alligators are least like any other Old World animal in the Clovis faunule. The lack of familiarity with this animal likely engendered the most species specific changes to Early Paleoindian behavior. As most Clovis sites across the lower portion of the continental United States are directly associated with waterbodies it is very likely that Clovis people encountered alligators much more frequently than is indicated by the archaeological faunal assemblage compiled here. Numerous additional underwater sites in Florida contain alligator remains. However, very few have been found in dated closed contexts from the Terminal Pleistocene. Page/Ladson (8JE591), FL should also be included in Table 2:11 for the dated presence of alligator but the original data are currently in the process of being published.

Table 2:11 *Alligator mississippiansis* remains from Early Paleoindian sites

Site	State	Comments
Sloth Hole	FL	Abundant, simply present
Kincaid Rockshelter	TX	Found in Zone 4
Lewisville	TX	X, 1 burned bone
N=3	N=2	1X, #2 =3 occurrences

Alligator remains are quite common at underwater sites in Florida. However, their disarticulated context of discovery and lack of clear modification inform us only that they were present and clearly had to be dealt with in the normal course of life. The burned bone from Lewisville and bone(s?) found in the Kincaid Rockshelter are likely both evidence that an occasional alligator was killed and eaten by early people in the lower United States. No modification to the Kincaid Rockshelter specimen is noted (Collins et al. 1989).

Reptile summary

The foregoing review of reptile representation and utilization at Early Paleoindian sites indicates that turtles and snakes have direct evidence utilization nearly 25% of the time they are found. Almost certainly the prehistoric utilization rate is underrepresented for the smaller and less likely to be modified species. Animal size and consumable portions will also influence the utilization evidence in other ways. Snakes, lizards, and most turtles are small and contain limited amounts of usable meat. Evidence of butchery is likely nonexistent and modified bones are not part of the normal food preparation. The usable portion size constrains what we might expect to find for all of the smaller species of plants and animals.

Table 2:12 Summary of occurrences and utilization data

Reptile Group	Utilized =X	Probably Utilized =X?	Presence Observed N=	All Occurrences & Util. Rate	Sp. Utilized of Total #
Turtles	9	7	50	66 16/66 24%	7/30 23%
Lizards	0	0	12	12 0/12 0%	0/9 0%
Snakes	8	4	44	56 12/56 21%	6/29 21%
Alligator	1	0	2	3 1/3 33%	1/1 100%
Totals:	18	11	108	137 29/137 12%	14/69 20%

The combined occurrences and utilized occurrences of reptiles indicate that of the Clovis menu items considered thus far only amphibians had less direct evidence of utilization or were less desirable as a food source. The apparent avoidance of reptiles, and amphibians for that matter, may have more to do with the lack of usable portions than an actual avoidance behavior. Certainly the turtles, snakes, and alligator were modified as a regular contribution to the Clovis diet, albeit at a rate lower than the seemingly preferred plants, invertebrates and fish. Table 2:12 is designed to illustrate the wide range of Early Paleoindian selection behavior exhibited among the various orders of reptiles available. The different reptiles should be considered separately to avoid masking variability in the resource exploitation patterns exhibited by Early Paleoindians.

Figure 2:5 shows the greatly reduced geographic distribution of utilized reptiles when compared to the denser and broader range shown in Table 2:4. The 14 states with reptiles present in Early Paleoindian contexts have been reduced to six states with direct evidence of utilization at those sites. This range reduction is likely related to both actual Paleoindian behavior and archaeological recovery and analytical methods. Potter Creek Cave, CA, Burnet Cave, NM, and Conkling Cave, NM sorely need thorough examination

with modern techniques. There are enough indications of Early Paleoindian involvement with larger animals at these sites that utilization of many of the smaller animals at the end of the Pleistocene will certainly be verified and augmented with future work.

Aves From Early Paleoindian Sites

The suite of birds present at Early Paleoindian sites across North America includes 50 identified species from 20 sites in nine states. Ten of these sites also include an additional single(?) unidentified bird species. Unfortunately these ten unidentified bird occurrences include half (5 of 10) of the solid evidence of bird consumption by Early Paleoindians. Unless these five unidentified species include multiple occurrences of the same species, the diversity of birds utilized is likely an accurate reflection of generalized bird exploitation by people at the sites listed below.

The 10 utilized bird occurrences are from Alaska (1), California (1), and Texas (8 at 5 sites). Additional evidence of utilization is likely unreported as many of the sites with birds were excavated long before detailed faunal reporting became standard. This is particularly true of the sites in California and New Mexico .

The geographic distribution of birds in Early Paleoindian archaeological sites is remarkably patchy. Figure 2:6 shows that only New Mexico and Texas share a border. All seven other states are isolated from one another. As preserved avian fauna occur in only 8% (20 of 246) of the Early Paleoindian sites with preserved bone across North America, the geographic range covered is surprisingly small.

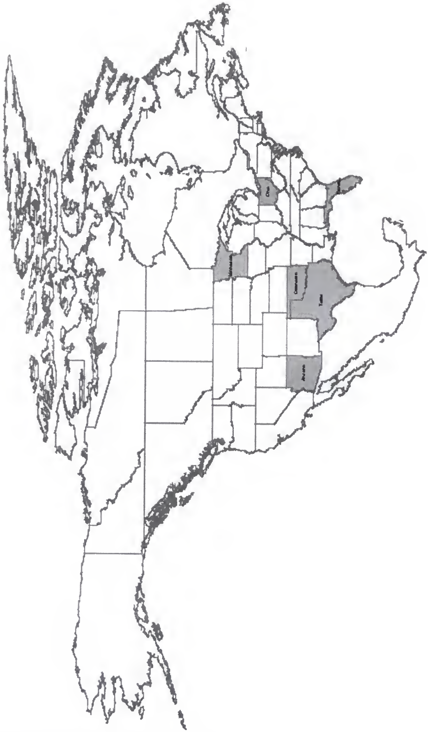

Figure 2:5 Utilized reptile distribution summary

Table 2:13 Avian sites

Site	State	Species #	Notes
Aubrey	TX	3	X Uid. + 2 unused species
Horn Rockshelter #2	TX	1	X? Uid Strata 3 hearth?
Levi Rockshelter	TX	1	X? Uid probably burned
Lewisville	TX	2	X Uid in H1,4,6 X? raptor
Lubbock Lake	TX	13	3X? Cut? Pintail, gadwell, and turkey
Wilson-Leonard	TX	1	In bone bed above Clovis
Blackwater Draw G.S.	NM	1	Uid. Grey Sand
Burnet Cave	NM	18	No utilization evidence reported
Conkling Cave	NM	6	No utilization evidence reported
Sandia Cave	NM	2	Uid but level reported
China Lake	CA	8	No utilization evidence reported
Tule Lake	CA	1	X? hearth, numerous Uid species
Potter Creek Cave	CA	1	Mountain quail, no utilization evidence?
Broken Mammoth	AK	5	X? tundra swan, 4 in Cult zone iv
Coats-Hines	TN	1	Turkey phalanx w/34 artifacts
Dutchess Quarry Cave #3c	NY	1	Cave 8 weak site?
Hiscock	NY	2	Grebe & California Condor present
Lange-Ferguson	SD	2	Duck & finch simply present
Little Salt Spring	FL	1	Wood Ibis simply present
Manis	WA	1	Duck but age questions
20 sites X/X? at 6 sites	N=9	50	2X, 8X?, #61 present =71 occurrences

Considering the numerous sites (20) and occurrences (71) of the 50+ bird species it is rather surprising that so few have any evidence of modification or utilization by Early Paleoindians. Only 10 of 71 (14%) bird occurrences are utilized. The archaeological record of 10 utilized bird sites is comprised of five identified species and five occurrences of unidentified species that are counted as only one in measuring diversity of species utilized. This means only 6 of 50 (12%) bird species present in Early Paleoindian sites were utilized.The lack of geographic clustering of occurrences and the apparent lack of specific bird preferences seems likely to indicate that birds were taken opportunistically when available. The cultural continuity advocated for the technological adaptation (i. e. one specialized Clovis toolkit) that facilitates a generalized subsistence

Table 2:14 Avian species from Early Paleoindian sites

Species	# of Sites	Comments
Aves- UID birds	10	2X, Aubrey Lewisville, 2X? Tule Lake, Levi RS
Raptor- falconiformes	1	X? Lewisville
Phasianidae	1	Wilson Leonard above Clovis
Perching birds- Passeriformes	1	Aubrey, 2 loci
Ptarmigan	1	Broken Mammoth Cult zone iv
Roadrunner- Geococcyx califor. conk	1	Conkling Cave, NFD
Pied billed grebe- Podilymbus podiceps	1	Hiscock,
California condor-Gymnogyps califor.	3	Burnet, Conkling Caves, Hiscock
Turkey vulture-Cathartes aura	2	Burnet Cave and Conkling Cave
Black Vulture-Coragyps atratus	2	Burnet Cave and Conkling Cave (MNI 47 C. C.)
Cormorant- Phalacrocorax sp.	1	China Lake- no further data
Tundra swan- Cygnus columbians	1	X? Broken Mammoth, hearth, culture zone iv
Goose/Duck- Anser sp.	1	Broken Mammoth, mostly young birds CZ iv
Duck- Anas sp.	4	Broken Mam, China Lake, Manis, Lange-Ferguson
Goose- Branta sp.	1	China Lake- no further data
Canadian Goose- Branta Canadensis	2	Broken Mammoth, CZ iv w/microblades, Lubbock
Snow goose- Anser caerulescens	1	Lubbock Lake
Pintail Duck- Anas strepora or acuta	1	X? Lubbock Lake
Gadwell?- Anas acuta or strepora	1	X? Lubbock Lake
Northern Shoveler- Anas clypeata	1	Lubbock Lake
American green winged teal Anas cr car	1	Lubbock Lake
Bay ducks- Aythya sp.	1	China Lake- no further data
Stiff tailed ducks- Oxyura sp.	1	China Lake- no further data
Swainsons hawk- Buteo swainsoni	1	Burnet Cave
Prairie falcon- Falco mexicanus	1	Burnet Cave
Sparrow hawk- Falco sparverius	1	Burnet Cave
Coopers hawk- Accipiter cooperi	1	Burnet Cave
Golden eagle- Aquila chrysaetos	1	China Lake- no further data
Lesser prairie chicken- Tympanuchus	1	Burnet Cave
Turkey- Meleagris sp.	1	X? Lubbock Lake, cut tibiotarsus?
Turkey- Meleagris gallopavo	2	Burnet Cave & Coats-Hines, TN w/34 artifacts
Turkey- Meleagris crassipes	1	Burnet Cave
Mountain quail	2	Burnet Cave & Potter Creek Cave
Bobwhite quail- Colinus virginianus	1	Aubrey
Virginia rail- Rallus limieola	1	Lubbock Lake
American Coot- Fulica americana	1	Lubbock Lake
Sage grouse-Centrocercus urophasianus	1	Conkling Cave
Crane- Grus sp.	1	China Lake- no further data
Crane- Grus Canadensis	1	Burnet Cave
Wood ibis- Platleides	1	Little Salt Spring
Horned owl- Bubo virginianus	1	Burnet Cave
Short eared owl- Asio Flammeus	1	Burnet Cave
Burrowing owl-Athene cunicularia	1	Lubbock Lake
Woodpecker- Colaptes auratus	1	Burnet Cave
Raven- Corvus corax	1	Lubbock Lake
Yellow head blackbird	1	Burnet Cave
Redwing Blackbird-Agelaius phoenic.	1	Lubbock Lake
Finch/sparrow/bunting- Fringillidae	1	Lange-Ferguson
Vesper sparrow- Pooecetes gramineus	1	Lubbock Lake
Crossbill- Loxia curvirostra	1	Burnet Cave
50 species= X or X? at 6 sites	71 Occ.	20 sites in 9 states

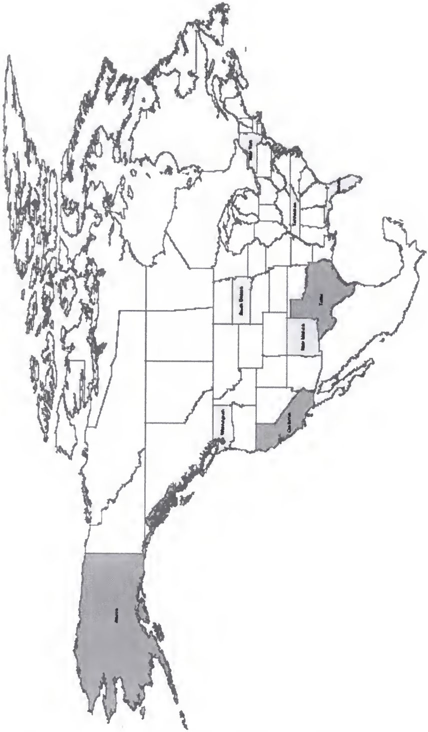

Figure 2:6 Aves in Early Paleoindian sites and utilization distribution

adaptation seems to be supported by Early Paleoindian bird exploitation. Namely, Early Paleoindians across North America exploited whatever bird was available but only occasionally. Birds might be a regular part of the Clovis diet but were certainly not relied upon.

Introduction to Mammals From Early Paleoindian Sites

The mammalian fauna from Early Paleoindian sites in North America dominates the sample of all biotic remains recovered to date. Eight hundred- seventy-three of the 1185 (74%) individually listed occurrences of potential food items in Appendix 2 are mammals. Large mammals, those greater than 50 kg in weight, comprise 44% (524 of 1185) of all recovered potential food remains. Larger mammal remains comprise 60% of all reported mammals from Early Paleoindian sites (524 of 873).

Clearly the mammalian fauna represents a much more robust dataset than that reported for all of the plants, invertebrates, and lower vertebrates. In total, 188 species with 312 occurrences have been summarized thus far. An additional 164 species of mammals are known from the 246 sites listed in Appendix 1. However, the fundamental difference between the mammals and the species discussed so far is that repeated patterned occurrence and utilization data exists for a great many mammals. As expected, the larger mammalian species predominate both in actual frequency and repeated occurrence of individual species.

Unidentified mammalian fauna

Smaller taxonomic groupings of families or species of mammals are used here. This is in contrast to the order and class level groupings of the lower vertebrates and plants. The mammalian species and occurrences will be summarized for only distribution and utilization data as the complete presentation of each species occurrence is given in Appendix 2. The mammalian discussion will focus on the larger, extinct fauna that has the most compelling direct evidence for utilization by Early Paleoindians. Smaller mammal species are included as they bear on the topic of Early Paleoindian subsistence but these sections will not include all mammals present in Early Paleoindian sites and detailed in Appendix 2.

Frequently the bones of animals are so poorly preserved that little more than their presence can be noted. The items listed in Table 2:15 include bones recovered from sites that need additional zooarchaeological analysis. Poor preservation and incomplete description of recovered archaeological remains combine to obscure our view of prehistoric subsistence for a considerable portion of what we have in hand. The sites listed here are included simply to document exactly which sites would benefit from complete reporting and analysis of the portion of the archaeological record already recovered.

Those unidentified taxa reasonably thought to have been utilized by Early Paleoindians at Tule Lake, Dietz, the Johnson Site, Horn Rockshelter #2, and Pavo Real are not likely to be identified further due to preservation limitations. The remaining sites are likely to benefit from additional analysis and complete reporting of the items

Table 2:15 Unidentified mammal remains from Early Paleoindian sites

Site	State	Comments: Critical to identify these animals if possible
Tule Lake	CA	X? in hearth
Wasden/Owl Cave	ID	Numerous unidentified small animals in Folsom layer
Indian Creek	MT	Medium and small animals not identified
Hiscock	NY	Numerous unidentified small animals
Sheriden Cave	OH	Numerous unidentified small animals
Howard Gully	OK	Numerous unidentified small animals
Dietz	OR	X unidentified blood residues on various points
Shawnee-Minisink	PA	Numerous unidentified small animals
Johnson 40DV400	TN	X burned, unidentified bone
Aubrey	TX	Numerous unidentified small medium large animals 6 loci
Gault	TX	Numerous unidentified small animals
Horn Rockshelter #2	TX	X strata 3 hearths with 8 unidentified burned bones
Pavo Real	TX	X? 3 unidentified bone fragments
Wilson-Leonard	TX	Various unidentified bones-Uid bone bed above Clovis
14 sites	10	Unknown % of recovered Clovis menu & diet obscured

identified. It is worth noting the geographic distribution of these ten states is essentially coast to coast with the greater Southeast represented only by Tennessee. Of the remaining 770 mammal occurrences listed in Appendix 2 nearly all are identified to at least the genus level.

Armadillo and sloth remains in Early Paleoindian sites

The seven armadillo and sloth species found at Early Paleoindian sites include only one extant member, the modern armadillo *Dasypus bellus*. Six identified species are extinct. Five of the extinct species have direct evidence of their utilization by Early Paleoindians. A *Megalonyx* pelvis with a projectile point embedded in it was found in Tampa Bay. Pictures sent to the Florida Bureau of Archaeological Research are the only evidence yet seen but they are compelling. Until access to the specimen is granted it is included as part of this research with the caveat that proper examination is sorely needed.

Table 2:16 Armadillo and sloth occurrences

Species	Site #	Comments
Giant armadillo- Holmesina sep.	4	X? Lubbock Lake Clovis butchery area+3
Armadillo- Dasypus novemcinctus	1	Kincaid RS- present on pavement (Z4)
Armadillo- Dasypus bellus	2	Sloth Hole & BWD bsw- simply present
Glyptodont- Glyptotherium fl.	2	X? Lewisville, simply present at Sloth Hole
Uid sloth	5	Wakulla BWD Etna Fishbone Cave Bee Co
Sloth-Glossotherium harlani	3	2X? Aubrey & Kimmswick-skin only? 1FL
Ground Sloth-Megalonyx jeff.	9	2X Sloth Hole & Tampa Bay
Shasta gr. Sloth-Nothrotherium	5	X? Conkling Cave w/human bones
7 Species-5 utilized	21 dif	2X, 5X?, #24 = 31 occurrences

The eight states represented indicate an expected, restricted, southerly distribution for these animals that crosses the continent from California, Nevada, Arizona, New Mexico, Texas, Missouri, Kentucky, to Florida. Utilization evidence of *Glyptodont* and *Holmesina* is restricted to Lewisville and Lubbock Lake in Texas respectively (Crook and Harris 1957; Johnson 1987). Evidence of Sloth utilization comes from Florida, Missouri, New Mexico, and Texas. The dermal ossicles of *Glossotherium* were the only sloth bones recovered at both Aubrey, TX and Kimmswick, MO (Ferring 2001; Graham 1983). It has been suggested these animals were skinned to make clothing out of their armored hides (Graham 1983). No additional modifications are indicated but the lack of internal skeletal elements suggests the hides may have been the only portion retrieved.

Five of the seven (71%) species are utilized, but only in seven of the 31 (23%) occurrences. This high diversity of animals used infrequently may indicate that these large, slow moving animals could be killed at will but were not exactly a preferred food source among Early Paleoindians who encountered them. Further comparison of observation rates and utilization rates at the end of this chapter demonstrate previously unknown behavioral patterns.

Carnivore remains in Early Paleoindian sites

There are a total of 36 identified species of carnivores listed in Appendix 2 that occur a total of 132 times. This includes 15 occurrences of carnivores that are not identified to species level. Larger subunits presented here are the families canids, ursids, felids, and everything else combined as "other". The specified groups generally include the more frequently observed, larger, extinct animals that coincidentally typically have more evidence of utilization. Figure 2:7 shows the total carnivore distribution in Early Paleoindian sites. Alberta and Ontario are the first provinces of Canada included in any of the faunal sections. Fourteen states and two provinces are highlighted. The evidence of Early Paleoindian carnivore utilization is considerably limited from the overall distribution but a considerable spread is still indicated with hints of patterned selection and avoidance. Carnivores are briefly summarized after the felids.

Canids

Nearly a dozen identified species of foxes, wolves, coyote and maybe dogs have been found in Early Paleoindian sites across much of western North America, Ontario, and Florida, 12 areas in total. These eleven or more species occurred 59 times at 28 sites. Canids have both high frequency of occurrences and diversity of species represented. Conversely there is rather limited evidence of utilization or direct interaction with canids by Early Paleoindians. Only nine of 59 (15%) canid occurrences appear utilized. However, the diversity of species available versus those actually utilized is fairly high at five of 11 (45%).

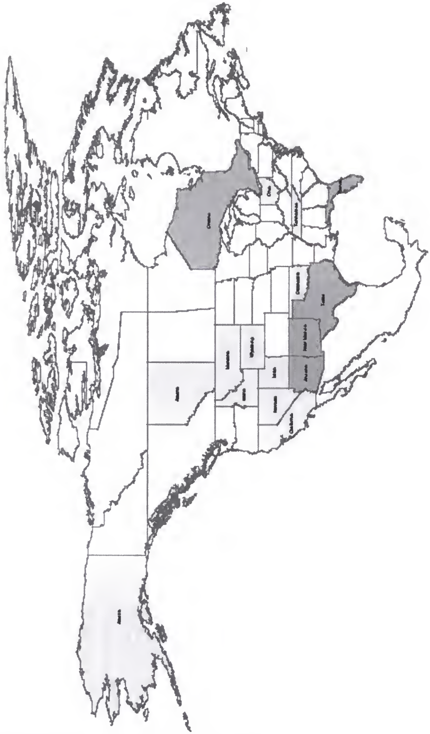

Figure 2:7 Total carnivore distribution and utilization

Table 2:17 Canids from Early Paleoindian sites

Species	Site #	Comments
Grey fox-Urocyon cinereoargent.	3	1X? Levi RS, TX burned? +NM & CA
Arctic fox- Apolex lagopus	3	1X Udora, Ont, present in 2 AK sites
Kit fox- Vulpes macrotis	2	Ventana Cave, AZ & Lubbock Lake, TX
Red fox- Vulpes vulpes	4	PCC, Wasden, BWD bsw, Burnet Cave
Swift fox- Vulpes velox	3	NM only: BWD bsw, Burnet Conkling Cave
Western red fox-Vulpes macroura	1	Burnet Cave, simple presence
Dire wolf- Canis dirus	11 ext	2X Powerline FL, BWD gs, 2X? Levi 2oc
Canis sp? coyote, dog or wolf	10	ALB, AZ, FL, NM, OK, TN, TX, WY
Canis sp? wolf	3	1X Lewisville claw in hearth
Timber wolf- Canis lupus	7	1X? Murray Springs, AZ; +NM, MT, TX
Buffalo wolf?- Canis nubulis	1	Burnet Cave- valid species? Simply present
Coyote- Canis latrans	11	1X? Levi, TX; +AZ, CA, NM, TX present
11 Species identified	28	4X, 5X? #50=59 occurrences

The dire wolf seems to be the only canid with repeated evidence of interaction with Early Paleoindians in four of 11 (36%) occurrences or representing 44% of all utilized canids, four of nine. The exceptionally large mandible ornaments from the Powerline Site, Aucilla River, Florida, are discussed extensively in Chapter 3 (see also Webb and Hemmings 2001:7). There was a mandible found at Blackwater Draw with a Clovis point close enough to have been stuck in its face (Hester 1972).

Though not counted here as a canid occurrence, the *Palaeolama* sacrum carved into the face and head of a coyote, or domesticated dog, clearly demonstrates a familiarity with the smaller canids (Aleveyra 1965). Whether or not Early Paleoindians actually had dogs does not yet appear to be conclusively decided (*sensu* Olsen 1974).

Ursids

Bears are present in 12 Early Paleoindian archaeological sites. Six species are represented by 15 occurrences. Three species are extinct, yet the cave bear and giant Pleistocene bear both have evidence of probable utilization by humans. Seven of the 15

(44%) bear occurrences in total appear to have been utilized. The usage of nearly half the bear occurrences is three times the rate seen for canids, the second most heavily exploited carnivore group. The selection of preferred bears may be suggested when the 15 occurrences are considered by species. *Tremarctos* is only represented by a tooth fragment from Sloth Hole.

Similarly unique is the discovery of Grizzly (brown) bear at Blacktail Cave, Montana. Grizzly bears immigrate into North America sometime very late in the Pleistocene and should not be expected to occur at Clovis sites. Grizzly bears are dated directly to 12,300 to 10,000 years ago on Prince of Wales Island, Alaska and it is noted that they do not appear anywhere in Alaska prior to 13,000 years ago (Heaton and Grady 1993:99). Blacktail Cave is a Goshen site, which are typically thought to have a slightly overlapping temporal range with Clovis and in fact some extinct fauna do appear to have been utilized by Goshen people (which warrants their inclusion in Appendix 2). The presence of Grizzly at Blacktail Cave may be an independent confirmation of a slightly post Clovis/Terminal Pleistocene age assignment for Goshen.

There are four occurrences of the short faced bear *Arctodus simus* in Ohio, Texas, Utah, and California. None have evidence of interaction with or utilization by early humans. It has been suggested that this bear was extinct in the lower continental United States prior to the arrival of humans, or that Early Paleoindians avoided this monstrous predator whenever possible. The idea that the short faced bear posed an impediment to colonization is rather exaggerated but not totally insignificant (Matheus 2001). The eight unutilized bear reports include two unique species occurrences, four unencountered or avoided short faced bear loci, and two black bear occurrences. The black bears at

Blackwater Draw and Potter Creek Cave might have been utilized but this is not entirely clear (Hester 1972; Putnam 1906). The evidence for utilization of seven of 15 occurrences and the understandable lack of such evidence for six more suggests patterned selection of bears when anything other than *Arctos simus* was encountered.

Table 2:18 Bear remains from Early Paleoindian sites

Species	Site #	Comments
Bear- Uid species	1	X? Murray Springs, AZ
Cave bear-Arctodus or U amer	1 ext	X? Conkling Cave, NM near human burial
Giant Pleistocene bear-Arctodus?	2 ext	2X? Burnet Cave & Lubbock Lake
Short face bear-Arctos simus	4	PCC Sheriden Lubbock Huntington Can UT
Black bear-Euarctus=U am?	1	X Lewisville H4
Black bear- Ursus americanus	4	2X Lewisville H4 +Lehner-burned cub
Brown bear/Grizzly- U. arctos	1	Blacktail Cave w/Goshen?
Spectacled bear- Tremarctos flori.	1 ext	Sloth Hole, FL tooth simply present
6 Species identified	12	3X, 4X? #8 =15 occurrences

Direct evidence for utilization of bears is restricted to Arizona, New Mexico, and Texas. The simple presence of bears is noted from a much broader range that includes California, Utah, Montana, Ohio, and Florida. The unused bear occurrences overlap with the utilization evidence range only at Blackwater Draw, NM and Lubbock Lake, TX. The states with no bear utilization evidence typically do not contain the bears that are utilized elsewhere. Most available bears appear to be regularly utilized but not the larger, faster short faced and grizzly bears. Seventy percent (7 of 10) of the other bear occurrences are utilized, which is 44% of the total (7 of 15). It is suggested bears may have been a preferred Paleoindian food source when feasible to take them.

Other carnivores

A wide range of different carnivores are consolidated in this section. There are 38 occurrences of 11 identified species and some additional animals unidentified beyond family. Only Levi Rockshelter and Lewisville, TX have evidence of utilization. Bones of badger and skunk appear burned at Levi Rockshelter (Alexander 1963; 1982). Burned bones of raccoon and striped skunk were found in hearths at Lewisville (Crook and Harris 1957; 1958). Both sites are in Texas demonstrating a very limited distribution for the evidence of utilized carnivores other than the three larger groups considered in this section.

The eleven states represented in this group do not include any not represented by the other carnivores. The presence of monk seal at Sloth Hole consists of one complete distal phalanx. This species was extirpated from the Gulf of Mexico in 1959 and Sloth Hole can be accessed directly from the ocean. There is no evidence of modification. The bone is well enough preserved that a direct radiocarbon assay should be possible. If the monk seal toe is 10,000 years or older it becomes extremely important to note that the gulf would have been many miles away at that time. If dated to the Pleistocene this animals presence becomes that much more significant as part of a very early aquatic resource occurrence in North America, both as evidence of long range procurement and/or mobility.

Felids

A fairly substantial sample of cat remains have been recovered from 12 sites in California, Arizona, New Mexico, Texas, and Florida. Six identified species are listed in Table 2:20, the same number of species reported for bears in Early Paleoindian sites. Unlike the bear data there is very limited evidence of felid utilization by humans at the end of the Pleistocene. The mountain lion from Levi Rockshelter may be burned

Table 2:19 Other carnivores from Early Paleoindian sites

Species	Site #	Comments
Unidentified carnivores	3	Delong, Aubrey, Wilson-Leonard present
Badger- Taxidea taxus	7	X? Levi RS 6 simply present
Wolverine- Gulo sp.	1	Blacktail Cave, MT w/Goshen
Monk Seal- Monachus tropicalis	1 extir	Sloth Hole 1959 extinct in Gulf of Mexico
Ringtail/Civet- Bassariscus ast.	3	PCC, Burnet & Conkling Caves- present
Raccoon- Procyon lotor	4	X Lewisville; +WMS, BWD bsw, Kincaid
Blackfoot ferret-Mustela nigripes	1	Burnet Cave, simply present
Otter- Lutra Canadensis	2	Broken Mammoth, AK & Sloth Hole, FL
American pine marten-Martes a	2	Potter Creek & Sheriden Caves, present
Fisher- Martes pennanti	1	Sheriden Cave, simply present
Ermine- Mustela ermina	1	Sheriden Cave, simply present
Unidentified mustelids-skunk	3	X? Levi RS; +Conkling & Wasden Caves
Spotted skunk-Spilogale putorius	2	Potter Creek & Conkling Caves, present
Small skunk- Mephitinae	1	Blackwater Draw bsw, simply present
Striped skunk- Mephitis mephitis	4	X Lewisville in hearth 4, CA, NM, 2TX
13 species identified	17	2X, 2X?, #34 =38 occurrences

(Alexander 1982). One half of a lynx mandible with three spiral designs carved in each face was found in the surface assemblage of Sloth Hole, FL. This could be a Clovis or Bolen artifact and is well worth the effort to date directly in the future. However, it most closely resembles incised lynx mandibles found in the basal levels of Tick Island's mound dating to slightly older than 8000 years ago (Purdy 1991). Until this artifact's age and potential cultural affiliation can be established it is documented here as occurring at an Early Paleoindian site but is not included in the formal bone tool chapter that follows. Figure 2:8 shows the better preserved incised face.

Table 2:20 Felid remains from Early Paleoindian sites

Species	Site #	Comments
Saber cat- Smilodon fatalis	4	CA, 2 FL, BWD gs- simply present
Lynx- Lynx rufus	4	1X Sloth Hole, PCC, Burnet-Conkling Cave
American lion- Panthera leo atrox	4	CA, 2 AZ, Sloth Hole, simply present
Small cat- Felis amnicola	1	Sloth Hole, type site, simply present
Mountain lion- Felis concolor	5	X? Levi RS, TX, 2 NM, PCC
Jaguar- Panthera onca	2	Ventana Cave & Warm Mineral Springs
6 Species identified	12	1X, 1X?, #18 =20 occurrences 10% X/X?

The remaining 18 occurrences of felids have little to no evidence of utilization by humans, much like the larger bear species. The concentration of most occurrences in Arizona, New Mexico, and Texas coincides with many of the sites repeatedly discussed throughout this chapter. The absence of felids at Lewisville, TX is somewhat perplexing considering how many other animals are present in the hearths (n=65, 58 clearly utilized). As top carnivores, cats are generally rare on the landscape, however, more felid occurrences in Early Paleoindian sites are reported than the heavily used bears.

Carnivore summary

The four groups of carnivores considered here include 36 identified and a number of additional unidentified species. Of the 132 reported occurrences 22 (17%) have evidence of utilization by Early Paleoindians. Canids (15%), others (11%), and felids (10%) all fall below the average rate of occurrence utilization. Bears were utilized at a rate nearly three times higher (44%) than the next closest group. The diversity of species present versus species utilized is much closer between the four groups: canids 45%, bears 50%, others 31%, and felids 33%. This might suggests that any given carnivore species had roughly an equal chance of being hunted on occasion. However, the extremely low rate of actual utilization of carnivores other that specific bears suggests that carnivores were not likely a preferred resource. If the short faced bear was actually avoided prehistorically then repeated patterned usage of the other bears goes up to 60% by species and 64% by observed occurrence.

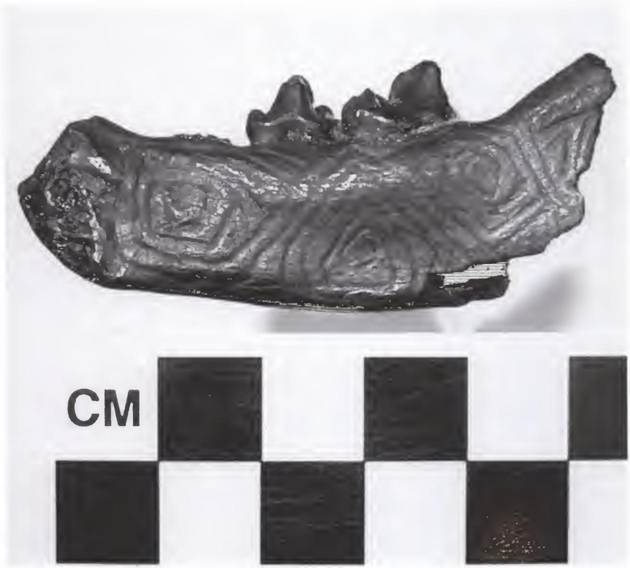

Figure 2:8 Sloth Hole incised *Lynx rufus* mandible

Rodents and other smaller mammals

Seventy-eight total species are considered in this section derived from Appendix 2. Only 20 of 78 (26%) have direct evidence of utilization by Early Paleoindians. Forty-three sites containing 210 occurrences of smaller mammals and rodents have evidence of being utilized only 27 times (27 of 210 or 13% by raw occurrence). However, only seven sites contained the 27 utilized occurrences of 20 species. The group of 78 species occurring 210 times is completely dominated by the archaeological record from Lewisville, TX. This one site contains 19 of 27 (70%) utilized occurrences. Furthermore, 15 of the 20 (75%) utilized species occur at Lewisville. Sans Lewisville, 191 small mammal occurrences contain five utilized species from 42 sites. Only 9 of the 191 occurrences have evidence of utilization (down to 5% from 13%). Beyond Lewisville, rodents and small mammals have minimal evidence of utilization by Early Paleoindians.

Two alternative explanations might account for the dearth of direct rodent utilization evidence: First, very little modification should be expected, certainly nothing on the order of a mammoth kill site. Burned bones and/or bones found in a hearth are likely to be the best evidence recovered. Second, Lewisville may simply have an exceptionally well preserved faunule that actually documents fairly closely how diverse and frequent small mammal and rodent utilization was by Early Paleoindians. The perceived absence of rodent utilization evidence may only be a function of preservation biases.

The superabundance of small mammal data from Lewisville aside, several of the remaining nine utilized occurrences are particularly significant. Remains of muskrat that

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appear to be utilized were found at Lehner Ranch, AZ and Lubbock Lake, TX (Haury et al. 1959; Johnson 1987). These are only two of the 13 occurrences but are significant for adding a predominately aquatic mammal to the Early Paleoindian diet, or possibly utilization of their pelts.

A very tentative suggestion for the utilization of capybara is offered based on the identification of a humerus with a severe green spiral break in the Vertebrate Paleontology collections of the Florida Museum of Natural History (UF#137905). This bone from the Aucilla 1A site does not appear to have broken naturally but is considered equivocal at this point. Capybara is the only extinct animal included in this section and the possibility that it was utilized warrants its mention until further research can determine if this animal was indeed killed or eaten by humans. Unmodified capybara remains have also been recovered in Sloth Hole.

The extinct giant beaver (*Castoroides ohioensis*) occurs in five sites listed in Appendix 2 but has no evidence of utilization. The *Castoroides* presence is noted from Sloth Hole, FL; Bridgeport and Lime Creek, Nebraska; Hiscock, New York; and Sheriden Cave, Ohio. Other beavers simply present are *Castor canadensis* at both Bull Brook, Massachusetts and Sloth Hole, Florida; and *Aplodontia rufa*, the mountain beaver, at Potter Creek Cave, California. The appearance of beavers in seven different Early Paleoindian archaeological sites with no evidence of prehistoric utilization is somewhat surprising.

Rabbits and hares

Unlike the very small rodents and other small mammals, rabbits and hares

Table 2:21 Rodents and other small mammals from Early Paleoindian sites

Utilized Species	Site #	Comments
Unidentified shrews	1	X Levi Rockshelter, burned?
Least shrew-Cryptotus parva	1	X Lewisville, three burned bones
Unidentified rodents	2	X Aubrey 6 loci; X? Horn RS2 Strata 3
Prairie dog-Cynomys ludovician.	6	X Lewisville hearths 1, 4, 5, & 8
Ground squirrel- Spermophilus sp	8	1X Lewisville hearth 1 & 4; 1X? Aubrey
Fox squirrel- Sciurus niger	1	X Lewisville Level 2, 5 bones, mni 2
Pl pocket gopher-Geomys bursar.	4	2X Lewisville & Aubrey (5 loci), OK, NM
Unidentified rats/mice & rats	4	2X Lewisville hearth 14/ hearths 8 & 15
Rice rat- Orzomys palustris	2	Lewisville, present at Aubrey
Pack/wood rat- Neotoma sp?	4	X Lewisville hearths 0, 4, 6, & 8 mni 4
Eastern woodrat	1	X Lewisville 2 burned bones
Cotton rat- Sigmodon hispidus	3	X Lewisville 9 b. bs; BWD Domebo Aubrey
Field mouse- Peromyscus sp.	2	X? Lewisville mni 3
Cotton mouse-Peromycus goss.	1	X Lewisville hearths 4 & 8
White footed mouse-P. leucopus	3	X Lewisville hearths 4 & 8; = P. manicu?
Muskrat- Ondatra zibethicus	13	2X? Lehner & Lubbock Lake; breakage pat.
S. bog lemming- Synaptomys coo	4	X Lewisville 5 burned bones
Eastern mole- Scalopus aquaticus	2	X Lewisville hearth 4
Unidentified vole- Microtus sp.	6	X Lewisville 2 burned bones
Meadow vole-M pennsylvaniucus	8	X Lewisville hearths 6, 4 &/or 8
Capybara-Neochoerus pinckneyi	2 ext	X? Aucilla 1A humerus spiral break 137905
Marmot- Marmota flaviventris	6	X? Indian Creek, MT calcined bones?
78 All rodent & small species/20x	31 all	20X, 7X? #183= 210 occurrences rodents+

may well have been a preferred subsistence resource of Early Paleoindians across North America. Eight identified species and several additional unidentified animals are reported from 26 sites in 11 states plus Ontario. Thirty-nine total occurrences have indications of being used 12 times (31%). The 12 utilized occurrences represent four of eight (50%) identified species. This suggests that not only were a wide variety of rabbits and hares likely to be used (50% of those observed in Early Paleoindian sites) but also they were used with considerable regularity (31% of all occurrences).

Rabbits and hares were utilized in Ontario, Washington, Wyoming, Arizona, and Texas. Seven additional states have rabbits present in Early Paleoindian sites but lack

Table 2:22 Rabbits and hares from Early Paleoindian sites

Species	Site #	Comments
Unidentified rabbit-Leporidae sp.	6	2X Udora ONT burn Wenatchee blood/point
Sagebrush rabbit- Sylvilagus sp?	1	Wasden/Owl Cave simply present
Cottontail rabbit- Sylvilagus sp?	5	1X Lehner Ranch; 1X? Levi RS burned?
Cottontail rabbit- S. nuttallii	2	X? Sheaman (AB area 9); Sandia Cave pres.
Lg cottontail- Sylvilagus flor/nut?	4	2X Lewisville h1,2,3,4,6 Aubrey burn 2 loci
NM cottontail- S. audoboni	3	Burnet, Conkling and Potter Creek Caves
Snowshoe hare-Lepus americanus	3	PCC, Broken Mammoth, Lange-Ferguson
Unidentified Jackrabbit-Lepus sp?	8	1X Lewis. h1,4,15;2X? Levi Rs Murray Spr.
Antelope jack- Lepus alleni	1	Burnet Cave, simply present
White tail jack-L townsendii	1	Burnet Cave, simply present
Black tail jack-L californicus	5	1X Lehner; 1X? Aubrey camp B
8 Identified species 4X/X?	26	7X, 5X?, 27# =39 occurrences

evidence of modification or consumption. Figure 2:9 shows the range of all recovered rabbits and hares and those areas where good evidence of utilization exists.

Peccary and javelina

Only a single occurrence of javelina (*Tayassu tajacu* – collared peccary) is reported, that from an Early Paleoindian level at Ventana Cave, AZ (Haury 1950). Eleven occurrences of *Platygonus compressus* (flat headed peccary) are reported from nine sites in seven states. Utilized *Platygonus* remains from Lewisville, Sheriden Cave, Levi Rockshelter, and Agate Basin Area 2 indicate fairly widespread use as a food source in Texas, Ohio, and Wyoming. Five of 11(45% utilized) occurrences are utilized which may indicate preferential selection when available. Wetzel noted that the recently discovered *Catagonus wagneri* (Chacoan peccary) would mill around a downed animal after it had been shot. If *Platygonus* behaved in a similar fashion harvesting entire groups would readily decimate populations (Wetzel 1977:540).

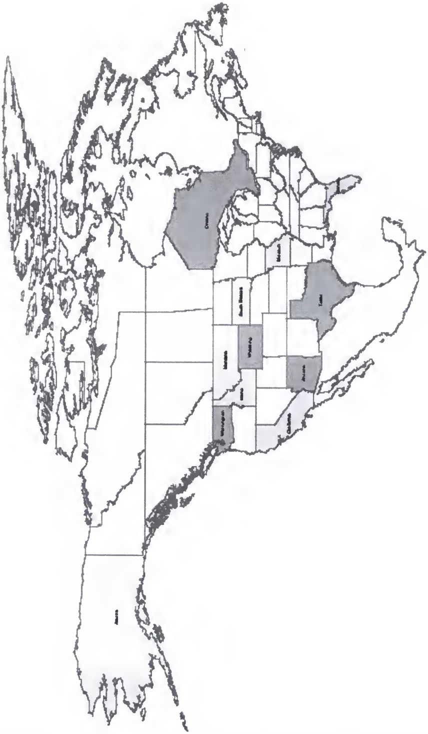

Figure 2:9 Rabbits and hares in Early Paleoindian sites and utilization distribution

Camels and llamas

The question of human and camelid association has received considerable attention in the archaeological literature over the years. George Frison (1978) considered 18 sites while Gary Haynes and Dennis Stanford (1984) considered 25 assemblages with *Camelops* alone. Haynes and Stanford (1984) concluded that two sites fit into each of their hierarchical layers of association and utilization evidence. Simple contempornaiety was suspected for Lindenmeier and Blackwater Draw. Direct association of humans and camels was believed for Colby and Agate Basin (Haynes and Stanford 1984). Finally, genuine utilization was thought to be demonstrated at Casper and Carter/Kerr-McGee (Haynes and Stanford 1984). Lehner was tentatively assigned to the utilized category as well.

In this section there are 31 sites with 34 occurrences of camel sp. or *Camelops hesternus* considered to be at least present in an interpretable archaeological context. Nine occurrences are considered to be evidence of probably utilization of this camel. However, unlike Haynes and Stanford, no evidence is considered to demonstrate unequivocal utilization. Gary Haynes asserts a similar position in 1988 (Haynes 1988:146). Only Carter/Kerr-McGee, Colby, and Lehner make both lists of probably utilized camel fauna (Frison 1984; Frison and Todd 1985; Haury 1956; Haury et al. 1959). The camelid data presented here, including the nine suggested occurrences of probably utilized animals, are based on literature review and not direct handling of specimens. All camelid distribution and utilization are shown in Figure 2:10.

Tanaolama reported from China Lake, CA is the single archaeological occurrence of this genus, which is properly considered *Hemiauchenia* (Davis 1982; Webb 1974). There are seven sites in Alaska, Arizona, New Mexico, and Florida that contain the smaller extinct Pleistocene camel *Hemiauchenia macrocephela*. Sloth Hole, Lubbock Lake, Lehner Ranch, and the Gray Sand layer of Blackwater Draw are all clearly Clovis occupations so it is quite probable that *Hemiauchenia* was available to humans, at least for a short time, at the end of the Pleistocene. That no evidence for utilization has been found is somewhat unexpected.

Table 2:23 Camelids from Early Paleoindian sites

Species	Site #	Comments
Unidentified Camel	12	2X? Carter/Kerr-McGee & Baja Mex +9
Camelops hesternus	19	8X? 2NV 3TX 2WY 1AZ
Hemiauchenia macrocephela	7	AK AZ FL 3NM TX never utilized
Tanaolama (Hemiauchenia)	1	China Lake, CA uses old name, present
Palaeolama mirifica	6	4X 3FL 1Mex; 1X? Sloth Hole cuts
3 species identified	37	4X 11X? #33 =48 occurrences

The presence and utilization evidence for *Palaeolama mirifica* has made a tremendous surge in recent years, particularly through the efforts of the Aucilla River Prehistory Project. Among the very first pieces of evidence for utilization of extinct Pleistocene fauna by Early Man to be recovered in North America was the sacrum of a *Palaeolama* carved into the shape of a coyote face discovered in1879 at Tequixquiac, Mexico (Aveleyra 1965). This object is thoroughly discussed in Chapter 3. In terms of animal utilization this bone is important because it was the only recorded occurrence of *Palaeolama* documented from a Paleoindian site for 130 years. The second occurrence of *Palaeolama* from an Early Paleoindian site was reported in Webb and Hemmings' (2001:6) chapter on bone and ivory tools in North Florida. This *Palaeolama* and the

Hemiauchenia discussed above it had their labels switched in Table 1:2 (Webb and Hemmings 2001:6). No *Hemiauchenia* interaction with humans is known. An unfinished metatarsal "dagger" from the Steinhatchee River, Florida is described and illustrated in Chapter 3.

The current evidence for *Palaeolama* presence and utilization by Early Paleoindians is quite impressive. It has recently been identified as simply present in the material recovered at Blackwater Draw by Gary Haynes (2002). The remaining four occurrences include clearly cut bones from Sloth Hole and an unknown site in the Santa Fe River, both north Florida. The final two occurrences are the metatarsal "dagger" mentioned above and a proximal phalanx heavily ground and carved into what is believed to be an atlatl hook. Both are fully described in Chapter 3. Of the six *Palaeolama* occurrences known from Early Paleoindian sites in North America five (83%) are unequivocally utilized animals. These include three formal tools or art objects. Clearly the vagaries of preservation and discovery have tremendous unseen influence on the materialupon which we base our interpretations. *Palaeolama* has gone from an animal not even reported present at a site for the entire 20th century to now seeming to be one of the most regularly exploited members of the extinct Rancholabrean fauna.

The camelid guild consists of three identified species that occur 48 times in 37 sites. Fifteen of the 48 (31%) occurrences are believed utilized. The 26 percent utilization of *Camelops* (nine of 34) and five of six (83%) utilization of *Palaeolama* are drawn down by the lack of utilization evidence for the other camelids. The utilization of two of three (66%) species may be deceptively low as well if *Hemiauchenia* was either not actually available or was avoided for some reason. The evidence is not

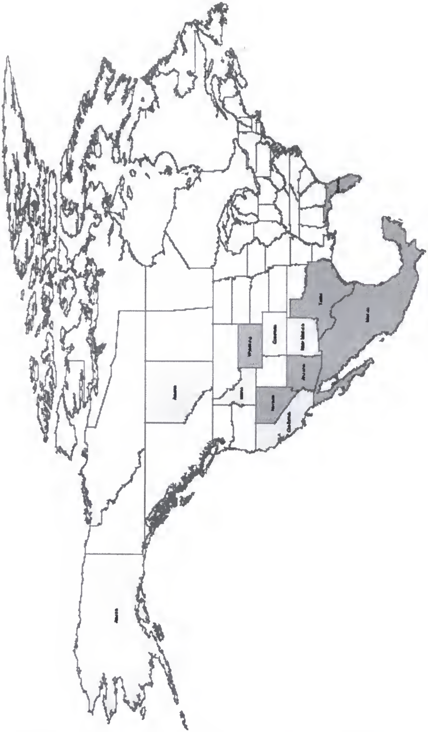

Figure 2:10 Camelids in Early Paleoindian sites and utilization distribution

overwhelming but *Camelops* does appear to have been taken repeatedly when opportunity arose in Wyoming, Nevada, Texas, and Arizona. The situation for *Palaeolama* is more compelling, nearly everywhere it was available it was taken (Mexico, Florida, and it was available in New Mexico). Half of the records of this llama were made into a formal tool or art object.

Antelope from Early Paleoindian sites

There are four identified species of antelope reported from Early Paleoindian sites. However, occurrences drop from 48 to 19 when compared with the three camelids. Twelve sites in Idaho, Wyoming, Arizona, New Mexico, and Texas contain all 19 occurrences of antelope. The very limited evidence for the utilization of pronghorn from the Sheaman Site, WY seems to be the only example of antelope exploitation by Early Paleoindians (Frison 1991). The grooved and snapped segment of a pronghorn metatarsal found in the Sheaman Site (Agate Basin Area 9) may in fact be debitage from bone tool manufacture (Frison 1982:156 and 164). Only one of the seven (14%) pronghorn occurrences has direct evidence of utilization.

Table 2:24 Antelope remains from Early Paleoindian sites

Species	Site #	Comments
Uid. Stockoceras sp.	1 ext	Conkling Cave, simply present
Conkling's pronghorn-S conklingi	1 ext	Ventana Cave, simply present
Quentin's pronghorn-S onusrogris	1 ext	Burnet Cave, mni 2, simply present
Uid. Antelope- Antilocaprid	2	Gault & BWD gray sand, simply present
Pronghorn-Antilocapra americana	7	X Sheaman metatarsal grooved/snapped
Diminu prong-Capromeryx minor	7 ext	4 NM & 3 TX sites, simply present
4 identified species ¼ X/X?	12	1X #18 = 19 total occurrences

Overall utilization evidence for all antelope drops to one of 19 (5%). Because the species sample size is only four a respectable 25% utilization rate by species is provided but clearly the story is the lack of utilization evidence among the other 18 occurrences.

The extinct diminutive pronghorn (*Capromeryx minor*) occurs seven times in New Mexico and Texas sites with no evidence of utilization by Early Paleoindians. Three of these occurrences are late or post-Clovis: the brown sand wedge at Blackwater Draw, the Folsom layer of Lubbock Lake, and the Midland site. The sample size of seven is large enough, and existed long enough with humans present, to suggest that this antelope was not a preferred food source.

Cervids from Early Paleoindian sites

There are 56 occurrences of eight identified species (and some unidentified occurrences) of cervids from 45 sites, summarized in Table 2:25. Figure 2:11 shows the distribution of cervid locales that essentially encircle the Great Plains.

Table 2:25 Cervid remains from Early Paleoindian sites

Species	Site #	Comments
Uid large cervid	8	4X MA, NH, PA, ONT; 3 USA all Clovis
Stilt leg deer-Sangamona fugitiva	1 ext	Burnet Cave, simply present
Mountain dr.- Navahoceros fricki	2 ext	Burnet & Sandia Caves, simply present
Moose- Alces alces	1	Broken Mammoth, Cult zone iv, fall kill?
Stag Moose- Cervalces scotti	3 ext	Sheriden Cave Hiscock Farview MI, present
Elk/Wapiti-Cervus elephas	2	X? Hiscock; B M Cult zone iv, fall kill?
Caribou-Rangifer tarandus	14	5X MA MI NH NSC ONT; X? ME+8 north
Deer/pronghorn? Unidentified	2	Aubrey & Wilson-Leonard, simply present
Unidentified deer- Odocoileus sp?	10	4X NM OH WA ONT; 6 simply present
Whitetail deer-O. virginianus	9	6X 3FL, MO, 2 TX; +1 NM MO TX present
Mule deer- Odocoileus hemionus	4	X? Lewisville hearth 1 & 4; +AZ 2 TX
8 identified species 4X/X?+X uid	45	19X, 3X? #34 =56 Occurrences

Twenty-two of the 56 (39%) occurrences have considerable evidence of utilization. Four of the identified species, and several unidentified animals, are included in the 22 utilized occurrences (or 50% of identified species). No clear utilization evidence exists for the three extinct deer and moose species known from Early Paleoindian loci.

There is a dramatic break in the geographic distribution and utilization by culture of caribou and all *Odocoileus* species. Figure 2:12 shows the general and utilization distribution of caribou. Figure 2:13 shows the utilization and general distribution of all deer species.

Identifiable caribou remains have been found at 14 sites in 8 states and 3 provinces of Canada. All eight are northern states. Only Ohio and Kentucky are south of the 40th parallel. Utilization evidence of caribou is restricted to the unglaciated area north of the 42nd parallel from Michigan to Nova Scotia. Six of the 14 (43%) caribou occurrences are utilized but only in four states plus Ontario and Nova Scotia.

The overall distribution of caribou in Paleoindian sites likely reflects their natural distribution on the landscape. However, the restricted Northeastern evidence of utilization more accurately reflects the distribution of Gainey (or Gainey/Clovis) sites and the specific animals they preyed upon. The implications of the biogeographical restrictions and their relationship with the cultural Gainey/Clovis system will be elaborated shortly. Suffice to say here that there is a tight fit with the utilized caribou distribution.

Both identified members of the genus *Odocoileus* (white tail and mule deer) are combined with unidentified deer on Figure 2:13. Deer occur 23 times at 19 sites in nine

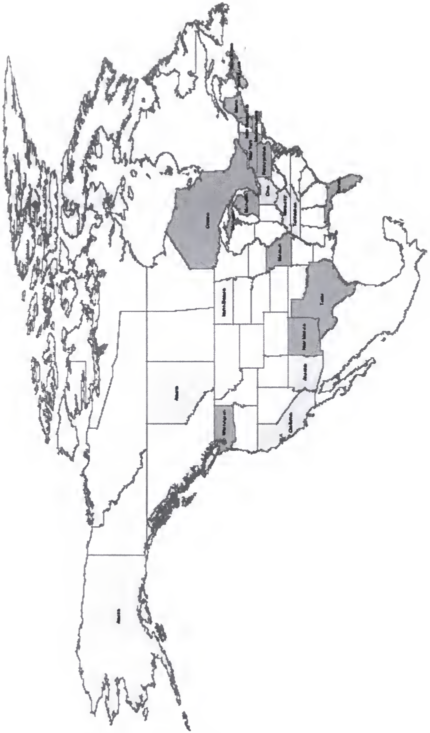

Figure 2:11 Cervids in Early Paleoindian sites and utilization distribution

states and Ontario, Canada. Utilization evidence is present for 11/23 or 48% or essentially with the same frequency that caribou are exploited. The overlapping distribution of utilized deer and caribou may be more tenuous than it first appears. The three sites with utilized deer north of the 40th parallel are subject to future taxonomic revision: East Wenatchee, Washington and Martins Creek, Ohio have blood residue on points that tested positive for deer; and bones from Udora, Ontario have been tentatively assigned to *Odocoileus* (Brush et al. 1994; Gramly 1996; Speiss and Storck 1990). Deer bones were found with associated with artifacts at Martins Creek, OH and the utilization evidence is stronger for this site (Brush and Smith 1994). Gramly actually says that any cervid could be represented by the blood residue on the East Wenatchee points (Gramly 1996). Essentially deer and caribou have non-overlapping areas of utilization on top of the fact that Gainey/Clovis seems to be slightly later than Clovis from other areas. Essentially there is no biological or cultural reason for the lack of overlap. This chronological assessment is based on faunal extinction and succession by other species and hopefully will eventually be confirmed (or disproven) by radiocarbon assay.

The 56 occurrences of cervids have evidence of being utilized 22 times or 39% of the times they have been found in Early Paleoindian sites. Because additional unidentified but clearly utilized cervids (more likely caribou than deer if the Gainey-caribou trend discussed above holds true) have been found in New Hampshire, Massachusetts, Pennsylvania, and Ontario, it is possible this caribou/deer dichotomy is even stronger than indicated here. The presence of elk at Broken Mammoth and Hiscock, both probably utilized, provides a limited view of the interactions with an animal that becomes more economically important in the Holocene (Holmes 1996:314; Laub 1988).

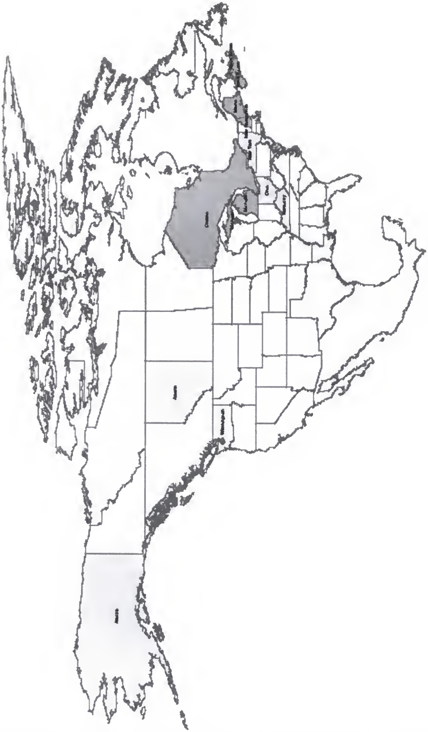

Figure 2:12 Caribou present in Early Paleoindian sites and utilization distribution

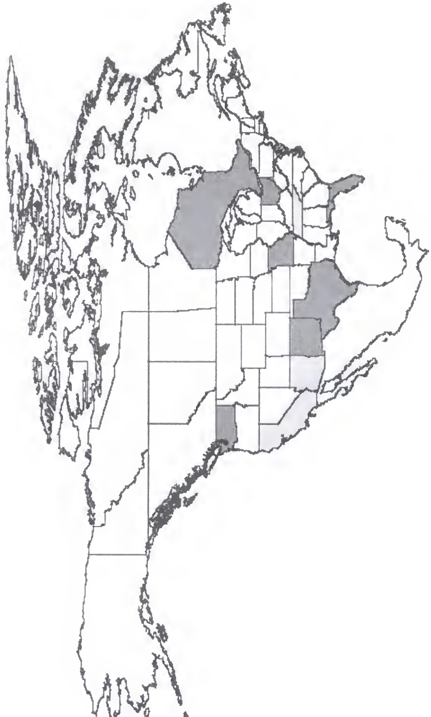

Figure 2:13 All *Odocoileus* types: presence and utilization distribution

Bison

Late Pleistocene extinct *Bison* are treated as a single species in this section because the taxonomic differences considered today do not appear to have influenced Early Paleoindian subsistence in any way. Furthermore, the various fossil species likely do not constitute actually different biological species incapable of breeding with each other. For clarity bison identified to species (*Bison antiquus*) and unidentified *Bison sp.* are separated in Appendix 2 and Table 2:26 below. There are a total of 53 extinct bison occurrences in Early Paleoindian sites across North America. Figure 2:14 shows the distribution of both simple presence and direct utilization evidence from Early Paleoindian sites across North America.

Table 2:26 Extinct *Bison* utilization summary

Occurrence N=53	Utilized (X)	Probably Utilized (X?)
Bison Uid sp. 16	1- E Wenatchee, WA	7= 1OK 1SD 4TX 1MEX
Bison antiquus 37	13- 2AZ 1Fl 1ID 1KS 1MN 1MT 2NM 1OK 3TX 1WY	5= 2 FL 1MT 1TX 1WY
Total 53/26x/x?	14X in 11 states	12X? 7states= Utilized in 13 states

In total, 26 of 53 (49%) *Bison* occurrences are utilized in 11 American states, Alberta, Canada, and Mexico. The inclusion of Wasden/Owl Cave, Idaho it very tenuous as the bison was directly associated with what is likely a Folsom point (Miller 1989). Until resolved, the entire Wasden faunule is retained, but it is excluded from the bison totals below.

The highly simplistic subsistence adaptation long used to explain the differences between Clovis and Folsom lifeways (i.e. Clovis- Mammoth Hunters: Folsom- Bison Hunters) is invalidated when it is shown that Early Paleoindians killed and/or ate

Bison at 25 sites (Meltzer 1993:106; Sellards 1952:113; Wormington 1957:30). Additionally, Early Paleoindian artifacts are associated with bison in 52 sites. Utilization of bison 49% of the time they were available indicates that they were among the preferred resources of the First Paleoindians.

Bovids, musk oxen, goat, and sheep from Early Paleoindian sites

This group of seven identified species from 14 sites has one occurrence per site counted in this section. Unidentified bovine blood residue was found on Clovis points from East Wenatchee, Washington (Gramly 1996) and Wally's Beach, Alberta (Kooyman et al. 2002). An unidentifiable mountain sheep or deer femur, thought to possibly be a bone tool was found at Colby, Wyoming (Frison 1986). This item is not included in the Clovis bone tool chapter as it seems to lack clear modification by humans that can be distinguished from other natural causes (Frison 1986:102).

The most significant utilized remains in this section are those of the musk ox (*Preptoceras sinclairi* ssp.) found in the hearth in Burnet Cave, NM with a Clovis point (Howard 1935). It is somewhat unexpected that there is so little evidence for even the simple presence of musk oxen in archaeological sites.

The remains of the sheep and goat lack clear evidence of utilization by Early Paleoindians but it is significant to note that nearly all large mammals on the landscape at the end of the Pleistocene have been found with archeological material indicating at a minimum these animals were available as a potential food source.

In total four of 14 (29%) animal occurrences in this group are utilized. Because the bovids are unidentified the utilization by species rate is exactly the same as the

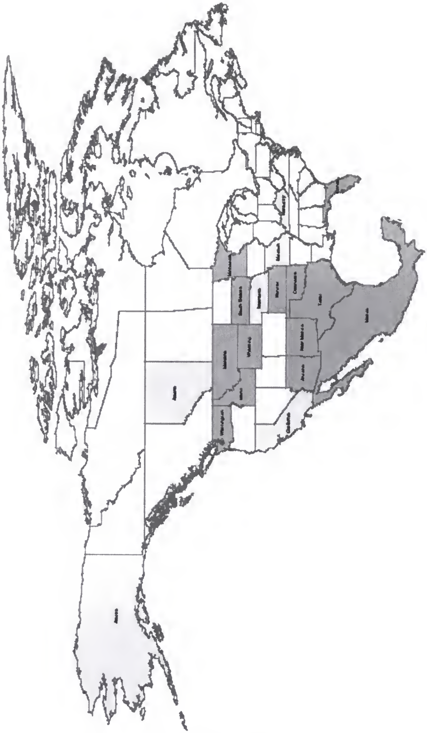

Figure 2:14 *Bison* distribution and utilization evidence

Table 2:27 Bovid, musk-ox , goat and sheep from Early Paleoindian sites.

Species	Site #	Comments
Unidentified bovines- Bovids	2	2X Wenatchee Wally's Beach blood/points
Shrub muskox -Eucerath collinum	2 ext	Burnet & Potter Creek Caves simply present
Muskox-Preptoceras sinclairi	1 ext	X Burnet Cave in hearth w/Clovis point
Muskox- Bootherium bombifrons	4	KY MT WY ALB simply present
Mountain Goat-Oreamnos americ.	1	Potter Creek Cave, simply present
Dall sheep- Ovis dalli	1	Broken Mammoth, simply present
Dall sheep?- Ovis auduboni	1	Burnet Cave, simply present
Bighorn sheep- Ovis Canadensis	1	Burnet Cave, simply present
Ovis or Odocoileus Uid species?	1	X? Colby weak tool NOT in Chapter 3 list
7 Identified species 1X 3X/X? uid	9	3X 1X? #10 = 14 Occurrences X/X? 4 sites

utilization by occurrence (two of seven or 29%). The scarcity of this many large mammals may reflect the real biogeographical situation in the late Pleistocene, rather than the lack of predatory interest on the part of Early Paleoindians. Some opportunistic exploitation is suggested but certainly not to the degree seen for other large and megafaunal animals from Early Paleoindian sites across the continent.

Equus from Early Paleoindian Sites

Pleistocene *Equids* are treated as a single species for the sake of discussing them here as potential and actual food sources for Early Paleoindians. The summary data in Table 2:28 are gleaned from Appendix 2. The 59 occurrences from 48 sites have evidence of horse utilization in 21 instances (21 of 59 or 36% of all occurrences are utilized).

The ten American states, Alberta, and Mexico that contain Pleistocene horses in association with Early Paleoindians are highlighted on Figure 2:15. Alberta, Arizona, Colorado, Nevada, Texas, Wyoming, and Mexico have direct evidence of utilization. Texas contains 16 occurrences, seven of which are utilized. New Mexico contains ten occurrences of Early Paleoindian sites with horse remains. Rather surprisingly none of the New Mexioc sites have direct evidence of the horses being exploited for food or tool stock.

Florida also has ten horse occurrences in Early Paleoindian sites. Five of the Florida examples are clearly utilized. Three "daggers" made from the metatarsal are described in Chapter 3, as is the tibia tool. A socketed handle made from a horse tibia, described by Dunbar and Webb in 1996, is among earlisest reports of clear horse utilization in North America, as well as being the first reported formal tool made from a Pleistocene horse (Dunbar and Webb 1996:343-346).

Wally's Beach, Alberta is touted by its excavators to have produced the first evidence of direct interaction between Pleistocene horse and humans in North America (Kooyman et al. 2001). This factual inaccuracy is corrected here. At a minimum the multiple occurrences of horse bones in Hearths 0 and 1 at Lewisville, Texas are clear evidence of horse utilization published in the same journal more than 40 years prior to Kooyman's assertion (Crook and Harris 1957 and 1958).

Table 2:28 Equus utilization summary

Species	Utilized (X)	Probably Utilized (X?)
Equus Uid species 39	7- 5FL 2TX	6-AZ CO 3TX NV 2Mex
Equus species 20	2- WY ALB	4- 4TX 2Lubbock 2Gault
Total Equus occ. 59	9X in 3 states+Alberta	10X? 4 states +2 Mexico

Although not typically thought of as Early Paleoindian food, the concentrated utilization of horses should not be terribly surprising. Rough comparison with the bison data (utilized at 27 of 53 occurrences at 49 sites in 19 states or provinces) shows that horses occur more and were utilized slightly less frequently but still in sizable numbers (utilized 21 times in 59 occurrences at 48 sites in 12 states and provinces). Bison have evidence of being utilized 49% of the time we find them compared to 36% for horses. It would appear that horses were indeed a regularly utilized resource for Early Paleoindians but perhaps not with the intensity and frequency that bison and the proboscideans saw

Tapir from Early Paleoindian sites

Remains of Vero tapir have been found at ten Early Paleoindian sites in Arizona (3), Florida (4), Texas (2), and Mexico (1). Six of the ten sites (60%) (Lehner, Murray Springs, Fossil Hole, FL, Hornsby Springs, FL, Sloth Hole, and Levi Rockshelter) have what appear to be utilized remains of tapir. These six sites are in Arizona, Florida, and Texas. Each of the areas with tapir present also has one site that lacks utilization evidence. The presence of tapir and peccary at Ventana Cave, AZ made Haury feel that at the end of the Pleistocene the area was less plains like and more savannah like than previously thought (Haury 1970:145). As tapir seems to coincide with the 20-inch rainfall line, Haury suggested that this portion of Arizona might have closely resembled interior savannah Florida at the end of the Pleistocene (Haury 1970:146).

The best evidence of utilization comes from Fossil Hole (8JE1497), which is an inundated quarry in the West Run of the Aucilla River (Hemmings 1999). This quarry was inundated prior to 8000 rcybp after being used for at least 3000 years. A single one-meter test unit was excavated in 1998 to demonstrate the intensity of use that this site had experienced. More than 42,000 flakes and cores were recovered from this single unit. In the 39 cm level 3 the fragmented left hind leg of a tapir was recovered along with more than 17,000 flakes. The calcined bones from this rich archaeological context are believed to be from an individual consumed while knapping work was occurring on that spot.

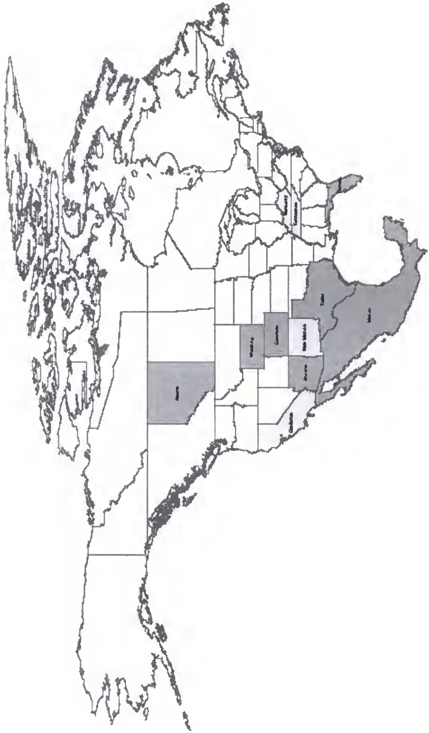

Figure 2:15 *Equus* in Early Paleoindian sites and utilization distribution

The high rate of utilization evidence for tapir seems to indicate that when available, across the southern latitudes of the continental United States, they were preferentially preyed upon. Sixty percent of utilization by occurrence ranks high among all species considered to be part of the Clovis diet.

Comments on proboscidean data

Early Paleoindians have unequivocally been shown to have gathered, killed, butchered, processed or made tools out of 112 species of plants, invertebrate, and vertebrate animals thus far. Yet few archaeologists could name more than a handful of plants or animals that Clovis people have been known to have eaten for more than 70 years. Meltzer (2004) insists utilization evidence exists only for mammoth and mastodon. The four proboscidean species that have been found associated with Early Paleoindian artifacts have entirely captured the publics imagination, and much of the academic community's as well. The density of proboscidean occurrences and utilization evidence necessitates division into manageable units. Unidentified proboscideans, proboscidean tools more likely to be mastodon than mammoth ivory, the American mastodon, unidentified mammoth species, the Imperial mammoth, and the Columbian mammoth are the groupings used to discuss the proboscidean species.

Table 2:29 Total proboscidean presence and utilization summary

Name	Total	Utilized (X) and MNI	Probably Ut (X?) MNI	Present (#) and MNI
Prob	20	10 =10+ 10 tool sites	7=7?	3 =3?
Ma>Mc	35	35 =35+ 35 tool sites		
M. a.	42	12 =18 8 tool sites	14=23	16 =16
M. sp.	33	8 =9 4 tool sites	10=10	15 =15
M. p.	2		1=1	1 =1
M. i.	2	2 =2		
M. c.	41	19 =76 6 tool sites	9=12	13=13
Totals:	175	86 sites= 152 animals	41 sites= 53 animals	48 sites= 48 animals

There are a total of 175 occurrences of proboscideans across North America at 157 actual different sites. Most are different sites but several are represented by proboscideans in two levels (BWD, Sandia Cave, etc). Two hundred fifty-three individual animals are present in the 175 known occurrences. One hundred twenty-seven of 175 (73%) proboscidean occurrences have unequivocal evidence of utilization of the various elephant species present (73% are utilized and 27% are simply present or the utilization level is unknown). However, when one examines the individual animals present (N=253) at the 175 occurrences the utilization evidence climbs to 205 of 253 (81% of the individuals are utilized and 19% are simply present or the utilization level is unknown). This indicates that if a proboscidean is found with early artifacts, 81% of the time we are able to determine that the animal was utilized.

Clearly the direct evidence of utilization of proboscideans by Early Paleoindians is much richer than anyone has previously thought (*sensu* Grayson and Meltzer 2002). The number of mammoths killed by Early Paleoindian Clovis people has been vastly undercounted since the excavations at Dent and Blackwater Draw in the 1930s (Figgins 1933; Howard 1935). The lowest number of individuals asserted was 38 by Grayson in 1984 (Grayson 1984). In 1986 Agenbroad suggested as many as 56 individual mammoths were killed by Clovis people (Agenbroad 1986). Considering that Dent, Blackwater Draw, and Lehner were excavated and published prior to 1960 it seems incredible that someone would pick a number below the 40 individual mammoths represented at these three sites (Figgins 1933; Howard 1935; Sellards 1952; Wormington 1957; Haury et al.1959).

Despite the wealth of information presented here potential pitfalls with the summary data are acknowledged. Foremost is the underreporting and lack of actual animal MNI data from given sites. The MNIs presented are the best inferences from the literature available. When the proboscidean presence is observed only as formal tools, only one individual is counted. Sloth Hole, Aucilla River, Florida has produced remains of four mastodons and one mammoth to date. Between 33 and 100 ivory tools were also found (non-mending tool fragments introduce the uncertainty). The site was counted for the five total proboscideans but the actual number of utilized mastodons alone may be higher than the four counted.

Individual sites with large numbers of mammoths associated with Clovis artifacts are counted as one occurrence for all individuals present but it should be noted that all individuals are not demonstrably utilized. Differential intrasite utilization of individuals will likely drive the individual numbers down by a small amount. Despite these potential fluctuations the summary of 253 proboscideans at 175 loci is considered a rather conservative starting figure for elephants associated with Clovis people, 81% of which were utilized. The evidence of utilized proboscideans is not going to decrease much as research continues to produce new sites and old data are examined in greater detail. Again, the Table 2:29 numbers are a starting point from which to build. The tendencies shown here are likely to be strengthened as more evidence accumulates.

Early Clovis Paleoindians do not appear to rely on proboscideans to the same extent exhibited in Folsom and *Bison antiquus* interactions but the utilization record is not insignificant anywhere in North America. Figure 2:16 simply highlights the gross geographic distribution of utilized proboscideans in North America. Uncovered sections of this map are far more likely to represent poor archaeological preservation rather than changes in adaptation in the unglaciated portions of the continent. When the distribution and density of fluted points are considered over the same area it is clear that many areas devoid of proboscidean remains have the highest concentrations of Paleoindian points (Anderson and Faught 2000). Florida being an isolated hot spot is a particularly perplexing enigma. The organic dearth of Early Paleoindian sites in Mississippi, Alabama, and Georgia stands in stark contrast to the dense concentrations of fluted points known for these states

Unidentifiable proboscidean

Several sites have produced complete or fragmentary bones that are clearly proboscidean sized but lack topographic features that would allow for specific identification. This is particularly true for some kinds of large bone tools. Frequently the thickness of cortical bone utilized in manufacturing a tool eliminates all other smaller taxa from consideration. Ten of the 20 sites in this category are bone or ivory tool locales. The high frequency of tools in this section coupled with numerous modified or cut bones indicates that 17 of 20 (85%) occurrences of unidentifiable proboscideans were utilized. They were recovered in 20 sites in 13 states and provinces. The utilized proboscidean elements were spread through 12 of the 13 geopolitical boundaries listed in Appendix 2. The probable cut bone from Edisto Beach, South Carolina is particularly important as the only Southeastern Coastal Plain occurrence of evidence for human utilization of Pleistocene fauna outside of Florida (Goodyear et al. 1990).

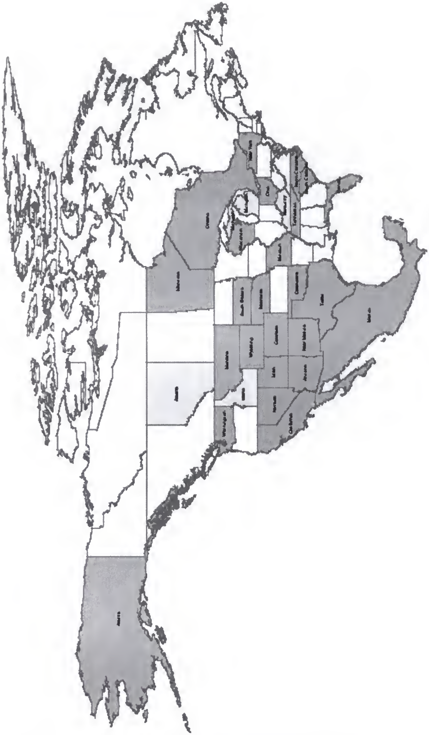

Figure 2:16 Total proboscidean distribution and utilization evidence

Unidentified proboscidean tools

Ivory tool fragments are the only clear evidence of proboscidean utilization known from 35 underwater sites in Florida. Thin sectioning of eight fragmentary ivory tools from Florida using the Fisher/Shoshoni method so far indicates that 100% are made from mastodon ivory (Fisher et al. 1998). Limited additional testing will be done in the future but it is hard to justify extensive destructive testing once the mastodon utilization pattern is firmly established. All 35 ivory tool only occurrences in Florida are considered direct evidence of utilization of proboscideans by Clovis people. As not all have yet been demonstrated to be mastodon they have been given their own provisional section.

Recent advances in analytical techniques and methods in conducting archaeological research with proboscidean ivory and ivory tools have greatly increased what can be learned regarding these animals and tools made from their tusks. Mastodon and mammoth ivory fragments can now be identified because of the recognition of unique structural properties in the Hunter-Schreger band pattern of each species (Fisher et al. 1998). Carbon, nitrogen and strontium stable isotope analyses allow for considerable insight into the individual life history of each proboscidean represented by ivory tool fragments (Hoppe et al. 1999; Koch et al. 1998). Current research extensively sampling this group of artifacts is expected to determine the area of origin for the individual elephants during life via assay of the bedrock and groundwater derived strontium signature (Hemmings and Mihlbachler in preparation). Further, continued advances in Thomas Stafford's AMS CAMS dating techniques now allow for direct radiocarbon dating of extremely small samples of ivory (Stafford 1988). As of this writing one sample from Sloth Hole has been successfully dated, as discussed in Chapter 1.

Mammut americanum

For many years evidence of American mastodon utilization by Early Paleoindians was highly contested (Dana 1875; Koch 1841). Ironically, methodological limitations thwarted Koch, for later discoveries at Kimmswick, Missouri have clearly demonstrated the utilization of mastodons by Clovis people in the same area (Graham 1981). Forty-two sites in 14 states, plus Ontario, have produced the 42 occurrences of mastodons in the Early Paleoindian sites listed in Appendix 2. Twenty-six of the mastodon sites have direct evidence of utilization (26/42 or 62% or occurrences). This utilization evidence is spread across 11 of the 15 areas highlighted in Figure 2:17.

Figure 2:17 shows the distribution of all mastodons in Early Paleoindian sites and those specific states that contained direct evidence of utilization. The 14 states, and Ontario, that have mastodon in Early Paleoindian contexts are fairly evenly distributed across North America. Direct utilization evidence from Manis, Washington (Gustafson and Manis 1984), Potter Creek Cave, California (Sinclair 1904; Putnam 1906), the Murphey Site, Texas (Story et al. 1989) and near Fairbanks, Alaska (Rainer 1931) fall outside the eastern core of mastodon sites. The widespread western mastodon utilization evidence is considerable even when contrasted with the greater concentration in the east (four of the seven states with such evidence).

The evidence for mastodon utilization in Florida is simply overwhelming in scope. Formal ivory tools, generally thought to be *Mammut* ivory, have been recovered from a minimum of 38 inundated sites in Florida's rivers. Direct evidence of mastodon utilization in the form of other formal bone tools and clearly butchered bones has been

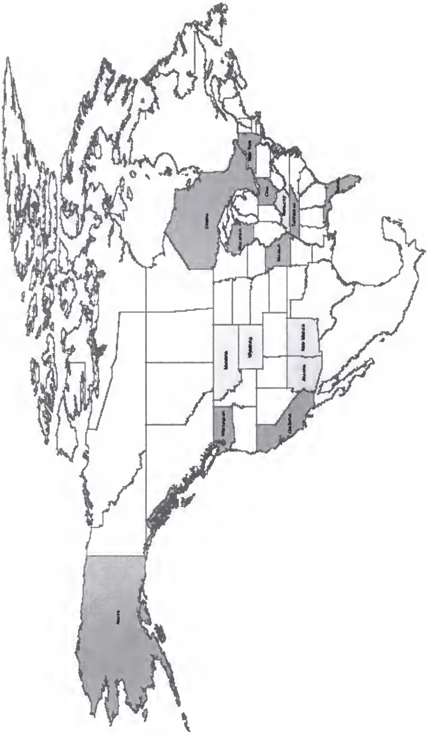

Figure 2:17 Mastodon in Early Paleoindian sites and utilization distribution

found at nearly a dozen more sites (Dunbar and Webb 1996). Current research involves directly dating numerous tools to help establish when exactly these interactions occurred.

When coupled with currently unidentified, but likely mastodon, ivory tools, the 26 identified mastodon occurrences here swell to suggest that more than 60 sites in North America indicate Early Paleoindians regularly exploited mastodons. Cultural and biological implications of this hunting are discussed with all proboscideans shortly. Specific indications of cultural interaction are considered in the Florida bone and ivory tool section of Chapter 3.

Unspecified *Mammuthus*

A considerable number of mammoth occurrences and mammoth kills (or those clearly utilized by Early Paleoindians) are not or have not been identified beyond the genus level (n=33 loci). More than half of the occurrences are mammoth kill sites (n=12) or formal bone tool sites (n=6). Eighteen of 33 (55%) of the sites with unidentified mammoth remains contain direct evidence of utilization.

The distribution of the unspecified mammoth sites mimics the overall distribution in Figure 2:16. In total, 13 American states and Alberta, Canada contain the 33 occurrences. Ten states contain the 18 utilized occurrences and mirror the distribution of utilized *Mammuthus columbi* fairly closely. The significant discovery of mammoth at four Goshen sites is expounded in their own section in Chapter 4. It is important to note the only culturally diagnostic artifacts directly associated with utilized extinct fauna in North America are a very limited number of Goshen sites and the numerous Clovis sites discussed throughout this work.

Mammuthus primigenius

The identification of *Mammuthus primigenius* from Potter Creek Cave, California and Schaefer, Wisconsin bears close scrutiny of the specimens to insure proper species assignment (Overstreet et al. 1997; Putnam 1906). This is particularly true of the Potter Creek material as it has been 100 years since the initial publication and there have been extensive modifications to the species diagnoses of mammoths since then (starting with Osborn 1921).

Evidence of modification or direct interaction with humans at Potter Creek Cave is not indicated in the published reports (Sellards 1952:123; Sinclair 1904; Wormington 1957:164). However, the illustrated drilled bones from the original report warrant inclusion in the unidentified proboscidean section as well as the bone tool section of Chapter 3 at least until they can be re-examined in greater detail (Sinclair 1904).

The Schaefer mammoth was found directly associated with human artifacts. Two flakes were found with the pelvis of this individual (Overstreet 1996; Overstreet et al. 1997). There does not appear to be any additional evidence of modification of this animal by Early Paleoindians.

Mammuthus imperator

The two Mexican occurrences of the Imperial mammoth appear to be individuals killed by Paleoindians at Santa Isabel Iztapan 1 and 2 (Wormington 1957). The projectile points associated with each mammoth bear more similarities to Scottsbluff and Lerma or Angastora respectively (Aveleyra and Maldonado-Koerdell 1953; Aveleyra 1956; Irwin-

Williams 1968; Wormington 1957). Both occurrences are counted with the direct utilization sites in Table 2:29. There are several unanswered questions regarding both of these weakly published sites, particularly the exact radiocarbon chronology. However, the direct association of artifacts with the Imperial mammoth is included in this sample until future research is able to determine the exact nature of the proboscidean interactions at these sites. The chopped rib illustrated by Aveleyra is particularly compelling (Aveleyra 1956:20 figure 6). Differences of opinion among mammoth experts leave the question of whether *Mammuthus imperator* is really a different species from *Mammuthus columbi* (David Webb, personal communication 2004).

Mammuthus columbi

Since the early discoveries of Clovis artifacts and Columbian mammoths at Dent, Colorado and Blackwater Draw, New Mexico the two have been inexorably linked (Figgins 1933; Howard 1935). Initially this further demonstrated the Pleistocene antiquity of humans in the New World and helped excite research in the field of Early Man research. However, those sites he found lacking mammoth were shunted aside as though somehow less worthy of continued research. The quintessential example of this is the neglect Burnet Cave, New Mexico has suffered since publication with the Blackwater Draw material that formed the basis of Howard's 1934 dissertation (see Howard 1935). Ironically, mammoth remains have since been noted in the collections from Burnet Cave (Sellards 1952).

The lack of emphasis on non-mammoth food sources in Clovis sites, despite their repeated discovery, has lead to a skewed conception of the untenable Big Game Hunters idea (Haury et al. 1958; Sellards 1952; Wormington 1957). The Big Game Hunter image of Early Paleoindians is only propped up by specialists who knock it down repeatedly (Grayson 1984; 1989; 1993; Grayson and Meltzer 2002; Meltzer 2002; 2003; 2004).

This fictive straw man is becoming even less tenable. David Meltzer (2004) now uses "kill site" as a synonym for any evidence of utilization. Literally, if there is no killsite there is no evidence that human beings ever utilized this specific animal (Meltzer 2004:550). By direct logical extension Native Americans, in more than 13,000 years, did not eat a single white tailed deer. There is not one *Odocoileus* kill site in North America (Haynes 2002:233). Further, a base camp such as Ventana Cave cannot be cited as evidence of resource utilization by Meltzer's logic, yet it is included in his analysis (without citing Haury 1970, Meltzer 2004).

Thorough use of the primary literature to create useful summaries clearly indicates that utilization evidence takes many forms other than killsites. As the last 100 pages have demonstrated, the Early Paleoindian adaptive subsistence regimen was much more robust and diverse than anyone has yet asserted. The known archaeological evidence for association and direct utilization of Columbian mammoth alone is tremendous both in distribution and intensity.

There are 39 sites listed in Appendix 2 that contain 41 co-occurrences of Early Paleoindian artifacts and Columbian mammoth remains. The Folsom(?) associated mammoth from Wasden/Owl Cave, Idaho is included for artifacts being associated with mammoth but the age and evidence for utilization seem weak (Miller 1989). These 39 sites are spread across 15 American states. Surprisingly, excluding Idaho, all 14 states contain direct utilization evidence for the Columbian mammoth. A clear western concentration is visible. Continental overlap with mastodon occurs only in Alaska, California, Texas, Florida, and Wisconsin. Figure 2:18 illustrates all Columbian mammoth occurrences and utilization evidence.

The only unidentified mammoth species from the eastern United States that would add to the geographic distribution picture are the remains from Big Bone Lick, Kentucky, which are not obviously utilized (Tankersley 1987). Big Bone Lick would likely have been the watershed Pleistocene man demonstration event in American archaeology had excavation methods been up to the task during initial excavations at this site. Six Clovis points have been found there since 1803, in the same areas as extinct Pleistocene fauna (Tankersley 1987). In any case, Big Bone Lick should be recognized as an important Clovis site that has been ruined by looting and non-archaeological excavation.

The sparse but widespread and overlapping evidence of mastodon and mammoth utilization indicate repeated patterned usage of proboscideans wherever they could successfully be taken. The evidence for preferential selection of Columbian mammoth is particularly strong as there is clear geographic clustering of the utilization within each western state where they occur with Early Paleoindian archaeological material (totaling 28 of 41 or 68% of all occurrences).

The utilization of both species of widespread identified proboscideans, and numerous unspecified examples, indicates a patterned subsistence adaptation that used the same technological approach continent wide to acquire preferred resources, namely proboscideans, wherever they encountered them. Highly adaptive Clovis generalist foragers utilized most every consumable resource available on the Pleistocene landscape. The evidence for patterned, preferential selection of proboscideans for food and toolstock

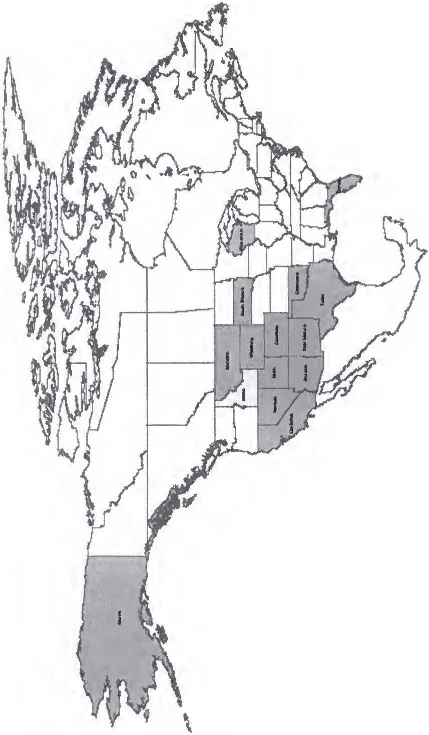

Figure 2:18 Columbian mammoth in Early Paleoindian sites and utilization evidence

does not suggest dependence or even strict reliance on these animals. Nevertheless it is appropriate to consider mastodon and mammoth staples of the Clovis diet.

Resource Availability and Utilization Patterns

In total, 351 species of recovered plants and animals form the observed potential Early Paleoindian subsistence base. This group is drawn from the actual potential food base that numbers in the thousands of species at the end of the Pleistocene. The 351 species simply represent exactly what has been found at Early Paleoindian sites across North America.

One hundred sixteen species have evidence of direct utilization by Early Paleoindians. Effectively 33% (116 of 351) of all species found associated with Early Paleoindians have direct evidence of exploitation based on context and/or modification to those remains. All observed potential and observed utilized plant and animals species are summarized in Table 2:30.

The 1185 occurrences of plants and animals from North American Early Paleoindian sites are split into the 37 groups presented in this chapter. Every species and occurrence listed in Appendix 2 is accounted for by one of the individual headings used in Table 2:30. The first column groups in bold type are not counted in the totals as they are summaries of specific sections discussed in the text. The numbers in the second column, Species and Utilization Rate, indicate the number of species in that group over the number of species in that group that were utilized and what percentage that represents. The number of sites can be considerably lower than occurrences because a site can have different layers with the same animal such as the Grey Sand and Brown

Sand Wedge at Blackwater Draw Locality Number 1 (Hester 1972). State number includes American and Mexican states and the Canadian provinces that are represented. The order of the numbers in Occurrences and Utilization Rate is- X clearly utilized; X? probably utilized; # simply present; = the total occurrences, over total of X/X? utilized occurrences and the percentage that represents.

The 37 group headings in column one are not entirely equal but they are designed to help make reasonable, interpretable statements about Early Paleoindian utilization of the resources available to them toward the end of the Pleistocene. The main bias is of course the heavy representation of the larger mammals. This is not likely to be simply a product of archaeological recovery, for mammals over 50 kg account for 44% (524 of 1185) of all potential food sources collected. There is enough variation in the large mammal sample to see differential exploitation patterns. While archaeological preservation and recovery will certainly influence how much of the actual Early Paleoindian subsistence adaptation we are able to reconstruct, it is believed that compiling all known occurrences and discussing what we really know is much more useful than any hypothetical modelling. Table 2:30 summarizes the current body of evidence regarding what resources Early Paleoindians consumed and utilized.

The 116 utilized species are nearly evenly split between mammals and all other groups (60 mammals and 56 among the flora, invertebrates, fish, amphibians, reptiles, and birds). It is interesting to note that only three of the 56 utilized non-mammals weigh greater than 50 kg. The two extinct land tortoises and alligator have direct evidence of utilization by Early Paleoindians and include the only extinct species of reptiles, or any non-mammals that go extinct for that matter.

Comments regarding patterned resource utilization and possible avoidance should be tempered with the thought that the sample size for some species is small enough that subtraction of a single occurrence can change whether a species was moderately or lightly exploited. Because the accuracy of overall compilation can only be considered a moving target it is important to keep in mind that the utilization comments and observed,

Table 2:30 Summary of all species and occurrences with their utilization rates

Taxonomic Group	Species and Utilization rate	Site #	State #	Occurrences and Utilization Rate by Occurrence
Flora	25/18 72%	11	8	16X, 4X?, #12=30/20 66%
Invertebrates	12+ 9?/11 93%	5	2	9X, 4X?, #1 =14/13 93%
Fish	15+?/5 33%	13	9	6X, 2X?, #18 =25/8 32%
Amphibians	17+10?/2 12%	17	11	1X, 1X?, #31 =33/2 6%
All Reptiles	69/14 20%	33	14	18x,11x?, 108=137/29 29%
Turtles tortoises	30/7 30%	26	10	9X, 7X?, #50 =66/16 24%
Lizards	9/0 0%	5	4	0X, 0X?, #12 =12 0%
Snakes	29+?/6 21%	19	11	8X, 4X?, #44 =56/12 21%
Alligator	1/1 100%	3	2	1X, 0X?, #2 =3/1 33%
Aves	50/6 12%	20	9	2X, 8X?, #61 =71/10 14%
Uid mam	0/5 **n/a**	14	10	3X, 2X?, #9 =14/5 36%
Armadillo Sloth	8/5 63%	21	8	2X, 5X?, #24 =31/7 23%
All Carnivores	36+15?/14 39%	36	16	10X, 12X?#110=132/22 17%
Canids	11+?/5 45%	28	12	4X, 5X? #50 =59/9 15%
Bears	6/3 50%	12	8	3X, 4x? #8 =15/7 44%
Other carnivore	13+?/4 31%	17	11	2X, 2X? #34 =38/4 11%
Felids	6/2 33%	12	5	1X, 1X? #18 =20/2 10%
Rodents+small	79/20 25%	44	14	20X 7X? #185=212/27(5%) 13%
Rabbits Hares	8+?/4 50%	26	12	7X, 5X? #27 =39/12 31%
PeccaryJavelina	2/1 50%	10	7	2X, 3X? #7 =12/5 45%
Camels Llamas	3/2 66%	37	12	4X, 11X?#33 =48/15(83%) 31%
Antelope	4/1 25%	12	5	1X, 0x #18 =19/1 5%
Cervids	8+?/4 50%	45	21	19X, 3X? #34 =56/22 39%
Bison	1 100% **n/a**	49	19	14X, 12X?#27=53/22 49%
BovidMoxG Sh	7+?/+2? 29%	14	8	3X 1X? #10 =14/4 29%
Equus	1 100% **n/a**	48	12	9X, 12X? #40 =59/21 36%
Tapir	1 100% **n/a**	10	4	1X, 5X? #4 =10/6 60%
Uid Proboscid.	0 100% **n/a**	20	13	10X 7X? #4 =20/17 85%
Probo Ma>Mc	0 100% **n/a**	35	FL	35X =35/35 100%
Mastodon	1 100% **n/a**	42	16	12X 14X?#16=42/26 62%
Mammoth sp	0 100% **n/a**	33	14	8X 10X? #15 =33/18 55%
Mam Primigen	1 100% **n/a**	02	2	1X? =2/1 50%
Mam Imperial	1 100% **n/a**	02	Mex	2X =2/2 100%
Mam Columbi	1 100% **n/a**	39	15	19X 9X? #13 =41/28 68%
All Prob	4/4 100%	157	28	86X 41X? #48=127/175 73%
All Mammals	163/60 37%	246	33+	154X 121X? #598=873 32%
Totals	351/116 33%	246	33+	237X152X?#796=275/1185 33%

Categories in bold are not counted in totals patterned exploitation behavior for plants and animals with samples sizes under five should be considered tentative (such as alligator).

Discussion of the Clovis Diet

Taxonomic groups listed in Table 2:30 are categorized as having low, medium and high utilization rates by occurrence and then compared against species utilization rate. Notable exceptions of exploitation for some species are also noted. The category boundaries are arbitrary but they tend to form clusters in relation to the observed intensity of exploitation of any group. The categories are 0-17% utilization by occurrence is considered low, 21-39% medium, and 42-100% high for the discussion presented here.

Low utilization rates by occurrence for Amphibians (6%); Lizards (0%); Birds (14); All carnivores (17% even with bears); Canids (15%); Other carnivores (11%); Felids (10%); Rodents and other small mammals (13% or 5% without Lewisville); and Antelope (5%) are likely caused by a multiple of species specific reasons. Actual animal scarcity in the Pleistocene either from pre-human arrival extinction, low density colonizing population levels, naturally scattered population density, and size related range restrictions can all influence not just availability of a given species but also what kinds of archaeological remains we are likely to recover.

Amphibians and lizards occur 45 times yet only have 2 instances of utilization. Terrestrial vertebrates other than land tortoises seem to be weakly targeted by Early Paleoindians across the continent despite their repeated occurrence in archaeological sites. Preservation and recovery do not appear to be the only causes of this lack of utilization pattern. The evidence of limited utilization of small amphibians, reptiles, and rodents or smaller mammals likely realistically reflects something about Paleoindian behavior. A plausible explanation is that small animals are not worth more effort than opportunistic utilization of these low utility species. Individual birds are likely to be difficult to capture with little meat to show for the effort. The possibility that small game can often be considered a gathered resource that does not require specialized skill or weaponry (i. e. anyone can do it) is considered in Chapter 4.

Carnivores other than some bears were very rarely utilized. For felids this might be due to actual rarity on the landscape at any given time. Other carnivores may be too small or difficult to capture to be worth the effort. Conversely, the short-faced bear may have been too difficult to procure because of its ferocity combined with its large size. Other than some bears discussed in highly ranked or utilized resources carnivores have very little direct evidence of utilization despite occurring more than 100 times.

While amphibians and lizards might have actually been avoided the remaining animals with low utilization rates likely were simply not worth the effort to target on a regular basis. This thought must be tempered with the note that the large number of occurrences is not likely to have much direct modification evidence as there is not complicated butchery process to be detected from the animal remains.

The single most difficult factor to assess regarding animal scarcity at Early Paleoindian sites related to animal behavior is determining exactly what procurement strategies might have been. Four species of antelope occur 19 times yet only one pronghorn from Sheaman, Montana offers direct evidence of being butchered by Paleoindians (Frison 1982). The smaller now extinct Pleistocene antelope may have been rare on the landscape by the time human beings arrive in the New World. The Clovis technological adaptation may have actually met its match in pronghorn. Simply put, these animals do occur, rarely, in Clovis sites (Frison 1991); they are known to be widespread at least on the Plains (Walker 1982). Yet the vast speed of pronghorn combined with their tendency to live in open habitats may have made them almost impossible to capture by people who seem more accustomed to surprising larger, generally slower animals.

Medium or moderately exploited resources include: Fish (32%); Snakes (21%); Alligator (33% of a very small sample); Armadillos and sloth's (23%); Rabbits and hares (31%); Cervids (39%); Bovids, musk-ox, goat, and sheep (29%); and Horse (36%). Patterned, repeated utilization of some species within each group is clearly indicated for members of this list. These could be preferred resources that we only see a portion of the behavior reflected in the archaeological record due to preservation biases. Further, many of these animals are not likely to have much in the way of obvious modifications. Fish, snakes, and rabbits and hares are not likely to preserve much butchery modification marks. Being found burned in a hearth after the fact is more likely to be the only way we can determine direct interaction.

Within the group of cervids, caribou and all deer should be considered heavily utilized resources: Caribou 43% (six of 14 occurrences) and all *Odocoileus* 46% (11 of 24 occurrences). Because they are discussed more extensively in newly arrived fauna and Clovis subsistence respectively, they are left within the broader cervid group for now.

Armadillos and sloths seem big and slow enough to fit with many of the highly utilized animals and may lack utilization evidence because they are not widely available by the time Paleoindians encounter them.

Highly or heavily utilized resources by percentage of occurrence from the available Pleistocene biota include: Flora (66%); Invertebrates (93%); Land tortoises (42%); Bears (47%) or 64% if the extinct short faced bear is removed from the sample; Peccary without the single javelina (45%); *Palaeolama* (83%); *Bison antiquus* (49%); Tapir (60%); Unidentified proboscideans (85%); Proboscidean ivory tools, likely mastodon (100%); Mastodon (62%); Unidentified mammoth (55%); *Mammuthus primigenius* (50% of only two); Imperial mammoth (100% of only two); and Columbian Mammoth (68%).

Because sample size per species increases dramatically for the larger animals, these groups may not appear to be entirely equitable with many of the lumped, lower utilized or ranked resources already summarized. However, the lumped groups created actual frequency of occurrence and utilization that are closely matched to the larger individual species samples as can be seen in Table 2:30. Within the group of heavily utilized resources listed above some of those with smaller sample sizes may over-represent the case for extensive utilization: *Palaeolama* with six occurrences and several others with 10 to 15 occurrences (see Table 2:30). However, because the level of direct utilization evidence is so high for each species it is clear that these were heavily selected, preferred resources repeatedly exploited when encountered.

Prey selection seems to have centered on medium, and larger, sized animals that could be killed without exceptional exposure to risk. Land tortoises, tapirs, peccaries, *Palaeolama*, some bears, bison, horse, and all the proboscideans were either susceptible to Clovis hunters because of their behavior (solitary, slow, etc.) or the hunting strategies were particularly efficient in taking these animals. Particularly favored easily acquired resources such as nuts, seeds and various invertebrates seem to have been targeted with some regularity. Ease of procurement coupled with low processing costs likely overcame the limited energy potential per unit of these smaller species as larger available quantities could make them more attractive resources.

There are 796 occurrences of plants and animals in Appendix 2 that are not considered to have direct evidence of modification by Early Paleoindians despite having been found in archaeological sites. This by no means demonstrates that these resources were not utilized Early Paleoindians, rather, the researchers have not yet shown conclusively that they were used in these occurrences. Additional collections research will certainly bolster the utilized resource dataset. Without doubt Clovis people utilized more than the 116 species discussed here. As new sites are discovered and new research techniques are applied to museum collections the species exploited and frequency evidence for resource utilization will continue to grow. Our image of the Early Paleoindian diet should be shaped by the direct evidence we have in hand.

As this work progresses in the future it is probably worth comparing herd animals versus more solitary animals in both age and sex profiles from the archaeological record with the idea that specific hunting strategies or selection patterns may be discerned based on who exactly was killed and butchered. This is a difficult task as much of this data is simply not published. Within the Early Paleoindian Clovis subsistence adaptation prey selection and diet breadth ranking of preferred species must have been locally derived from those available. Simple availability would be the closest to regional patterning of exploited resources we might expect to see. It is important to note that if this were the case the Clovis technological adaptation remains the same while the diet changes based on what is available regardless of local or regional environmental parameters.

A final observation leading into the next section is that the extinct reptiles (large land tortoises) are the reptiles with the best evidence of utilization by Clovis people. Any kill evidence should not necessarily be considered overkill evidence but people clearly had some adverse effects on tortoises upon arrival. The case for some direct human involvement in the Pleistocene large mammal extinction event is bolstered when you realize that of the heavily utilized resources only flora, invertebrates and two of five bears survive into the Holocene. In fact, of all extinct groups listed in Appendix 2 and Table 2:30, all were either moderately or heavily utilized by Early Paleoindians. The only heavily utilized species that do not go extinct in some fashion are the newly arrived caribou and the then rarer *Odocoileus*.

Pleistocene Faunal Extinction

Meltzer and Mead (1983) and Mead and Meltzer (1984) attempt to show that only eight of 35 now extinct Rancholabrean taxa survived past 12,000 radiocarbon years ago. By implication, Early Paleoindians would have had a reduced faunule from which to select prey. Clearly the situation is much more complex as can be seen by the extremely broad diet within the Early Paleoindian subsistence adaptation developed here. There are 38 extinct animals listed in Table 2:31, four tortoises and 34 mammals. Twenty of the extinct animals were clearly utilized by Early Paleoindians, 14 of them multiple times.

It is important to explicitly state what is meant by extinction in this context. Extinction can mean a wide range of actual reasons for disappearance of a given species from the Terminal Pleistocene landscape:

1- Extinct: gone from the planet.
2- Phyletic Extinction: species changes directly into another recognized form: *Bison antiquus* through allometric changes become *Bison bison.*
3- Extirpation or Range Reduction: *Ondatra* within Florida or *Equus* in the New World.

In Table 2:31, and throughout this text, extinction means that at a minimum the species no longer lives in North America.

The only regional Pleistocene extirpation considered in Table 2:31 is muskrat (*Ondatra zibethicus*), which recedes from Florida. Muskrat is included because the local data of presence and utilization is fairly reliable and relates directly to subsistence of Early Paleoindians in Florida. Extirpation data for each species locally is not typically published in the archaeological literature (see Mihlbachler et al. 2002). However, this specific issue can be addressed in the future and should be very useful in making our reconstructed faunal communities more robust. This could be particularly useful because of the tremendous diversity of rodents and other small, environmentally sensitive vertebrates in Appendix 2. To do this the individual faunal communities need to be compared to modern ones and locally and regionally extirpated species noted. The faunal community data can then be added to other finer grained environmental data from floral and pollen records that already exist.

Thirty-four species of mammals that disappear from North America at the end of the Pleistocene are present in Clovis sites, varying only in the amount and degree of utilization evidence we have in hand. It is absurd to suggest Paleoindians systematically eradicated the animals that went extinct. Direct evidence of overkill by Paleoindians is

Table 2:31 Extinct animals present in Early Paleoindian sites.

Taxon	**Common Name**	**Extinction Form**	**N=**	**Frequency**
Terrapene carolina putnami	Ext Carolina box turtle	Extinct	5	1X? 1X? #3
Geochelone sp.	Extinct large tortoise	Extinct	2	#2 Lewis LL
Geochelone crassiscutata	Extinct large tortoise	Extinct	4	1X, 2X?,#1
Geochelone equicomes	Ex. West. M-L tort.	Extinct	1	#1 Angus
Geochelone wilsoni	Ex. Western small tortoise	Extinct	4	#4
Holmesina septentrionalis	Giant armadillo	Extinct	4	1X? LL #3
Glyptotherium floridanum	Glyptodont	Extinct	2	1X? #1
Sloth unspecified	UID sloth's	Extinct	6	#6
Glossotherium harlani	Sloth	Extinct	3	2X?, #1
Megalonyx jeffersoni	Jefferson's ground sloth	Extinct	8	2X, #6
Nothrotherium shastense	Shasta ground sloth	Extinct	5	1X? conk #4
Canis dirus	Dire wolf	Extinct	11	1X, 3X?, #7
Arctodus or U. americanus	Cave bear	Extinct	3	3X?
Arctus simus	Short faced bear	Extinct	4	#4
Tremarctos floridanus	Spectacled bear	Extirpated G- N.A.	1	#1 Sloth Hole
Smilodon fatalis	Saber tooth cat	Extinct	4	#4
Panthera leo atrox	American lion	Extinct NW only?	4	#4
Felis concolor	Mountain lion	Recolonized N.A.?	5	#5
Felis amnicola	Small cat	Extinct	1	#1 Sloth Hole
Castoroides ohioensis	Giant beaver	Extinct	5	#5
Ondatra zibethicus	Muskrat 11 total sites	Extirpated–Florida	2/9	#2 FL, #9 USA
Neochoerus pinckneyi	Capybara	Extinct	2	#2 S.H. Auc1a
Hydrochaeris holmsei	Capybara	Extirpated G.-N.A.	1	#1 Sloth Hole
Platygonus compressus	Flat headed peccary	Extinct	11	2X, 3X?, #6
Camelid	UID camel	Extinct	12	2X? #10
Camelops hesternus	Camel	Extinct	22	8X? #14
Hemiauchenia macrocephela	Small camel	Extinct	7	#7
Palaeolama mirifica	Palaeolama	Extinct	6	4X 1X? #1
Stockoceras sp.	Extinct pronghorn	Extinct	3	#3
Capromeryx minor	Diminutive pronghorn	Extinct	7	#7
Navahocerus fricki	Mountain deer	Extinct	2	#2 Sand Burnet
Cervalces scotti	Stag moose	Extinct	3	#3 Gain>Cl
Bison sp.	Large bison	Phyletic extinction	16	1X 7? #8
Bison antiquus	Extinct large bison	Phyletic extinction	37	13X 6X? #18
Euceratherium collinum mor.	Scrub musk ox	Extinct	2	#2 PCC Burnet
Preptoceras sinclairi/ Bom bo	Musk ox	Extinct	5	1X, #4
Equus unspecified	UID horse	Extirpated New W	37	7X 7X? #25
Equus specified	Specific horses	Extirpated New W	20	2X 4X? #14
Tapirus veroensis	Tapir	Extirpated Gn-NA	10	1X 5X? #4
Proboscidean unspecified	UID proboscidean	Extinct	20	10X 7? #3
Proboscidean Ma>Mc	UID proboscidean tools	Extinct	35	35X all in FL
Mammut americanum	Mastodon	Extinct	42	12 14X? #16
Mammuthus sp.	Mammoth	Extinct	33	8X 10X? #15
Mammuthus primigenius	Mammoth	Extinct	2	1X? #1
Mammuthus imperator	Imperial mammoth	Extinct	2	2X
Mammuthus columbi	Columbian mammoth	Extinct	41	19X 9X? #13

X=utilized, X?=probably utilized, #=simply present, G=genus.

not necessary for them to have drastically influenced biological fitness and reproductive success rates of large mammals. Discussion here focuses on mastodon and mammoth because the record of their exploitation by humans is so intense and widely available in the literature.

The 22-month gestation period of modern elephants and 3 to 9-year birth spacing are highly sensitive to new stresses (Haynes 1991:65). In the case of mammoths and mastodons the stress is a suite of new predators on the landscape, including a superior predator that is clearly targeting proboscideans (175 occurrences with 253 killed proboscideans). Elephants can simply be harried or denied access to critical resources to negatively affect population replacement. The point that humans had some influence in the demise of the mammoth and mastodon is stressed, not that humans caused the extinction necessarily. The combined effects of climatic change, reorganized biotic communities, potential diseases, and other new predators in addition to human hunting and environmental modifications (e.g. fire) are likely to describe the total cause of extinction for the four proboscideans and the other 34 animals that disappear in North America. Certainly "Blitzkrieg" overstates the direct human causes but nonhuman environmental stresses alone do not explain why these animals went extinct either (Martin 1984:358).

Particularly confounding is the possibility that there is a growth spike among Proboscidean populations *after* the late glacial maximum (Ferring 2001:221 referring to McDonald 1984). Mammoth and mastodons were doing very well on the Late Pleistocene landscape prior to the arrival of humans. At the continental scale of proboscidean populations the direct evidence of Clovis kill, butchery and tool manufacture is admittedly not overwhelming. On the other hand, this evidence is not insignificant. As shown in Figures 2:17 and 2:18, the distribution and frequency of proboscidean remains in Early Paleoindian sites it much greater than researchers typically insist (e. g. Grayson and Meltzer 2002, who examined 76 sites). The cluster of mastodons utilized in Eastern North America essentially fills the vacant space in the mammoth distribution and utilization map (Figure 2:18). Early Paleoindians exploited proboscideans essentially everywhere they encountered them, repeatedly.

The single most useful avenue of research to pursue in the extinction debate is the direct AMS dating of individual bones from Clovis sites and non-cultural very Late Pleistocene locales. It is critical that bones selected for dating retain their collagenous component (Stafford 1988:41). Perhaps proboscideans occur at more sites because they survived longer. Current advances in dating technology will allow us to determine if serial extinction occurred across time and/or space as more individual animals are dated directly.

The very limited number of occurrences of Folsom material and extinct animal remains seems to support the notion of a rapid extinction event because Clovis and Folsom are statistically inseparable using the radiocarbon dating record (Collins 1999, see also Appendix 2). Clovis stratigraphically precedes Folsom at Blackwater Draw, Lubbock Lake, and Kincaid Rock Shelter (Collins 1999; Hester 1972; Johnson 1987). Clovis and Folsom (or Folsom-Midland) are not clearly stratigraphically separate at Wilson-Leonard and Pavo Real (Collins 1999:12). The Clovis and Folsom lithic assemblages have decided differences that reinforce what is seen here in the faunal assemblages (Collins 1999). Namely, Clovis was a specific cultural adaptation to a distinct set of environmental options that included regular utilization of a number of large mammals. Further, these options changed by the end of Clovis times and that environmental change is reflected in cultural change, namely, the recovered archeological remains of Folsom, Suwannee-Simpson, Cumberland, Gainey, probably Goshen, and other Middle Paleoindian cultural adaptations.

Newly Arrived Fauna and Notably Absent Taxa

A final concept regarding Early Paleoindian diet and available fauna that is woefully under-conceptualized is that *Homo sapiens* did not arrive from the Old World alone (see Harris 1985). At least three other carnivores first appear on the North American landscape coeval or after humans. The elk, moose, and musk-ox are essentially nonexistent in Clovis assemblages. Caribou may be added to this list. Particularly interesting for the 14 occurrences of *Rangifer tarandus* is that the points they are associated with are typically Gainey or Clovis/Gainey (Funk and Steadman 1994; Gramly 1982; MacDonald 1985). Of those species listed below only brown bears appear utilized in Early Paleoindian sites with any regularity (n=4).

Non-human Late Pleistocene New World Immigrants:

Canis lupus	Timber wolf
Canis familiaris	Domestic dog
Ursus arctus	Brown bear
Ursus arctus middendorffi	Grizzly bear (sometimes *horribilis*)
Cervus elephas	Elk/Wapiti
Alces alces	Moose
Ovibus moschatus	Musk-ox

The paucity of occurrences and utilization evidence for these animals may likely result from the recency of their arrival rather than from any lack of interest on the part of Early Paleoindians. As these immigrant species persist into the Holocene they all become more common and more closely associated with humans. The influence of dogs, wolves, and brown bears on the Pleistocene extinction event is difficult to calculate but must be considered a contributing factor. The human influence on extinction is not insignificant even if it is not catastrophic.

CHAPTER 3
CLOVIS OSSEOUS TOOLS

Introduction to Early Paleoindian Bone Tools

Formal bone and ivory tools were made in a wide variety of forms for numerous tasks within Early Paleoindian culture. The majority of the known osseous tools are directly related to subsistence either for hunting or personal defense. Hand held and launched points dominate the sample from Florida. Bone rods in various forms discussed shortly, are the single most common type outside of Florida. However, it should be noted that artistic modifications, personal adornment items, and tools of unknown function demonstrate that a portion of the known organic Clovis material culture is not strictly subsistence related. There are 10 organic tool forms that appear to be directly related to hunting, 22 more associated with other subsistence topics, and a dozen artistic or musical artifacts.

The particular subset of identified animals used to make bone and ivory tools includes *Canis dirus/lupus, Palaeolama mirifica, Odocoileus virginianus, Equus* sp., *Mammut americanum,* and *Mammuthus columbi*. Several tools are too heavily modified to determine exactly which animal was the source and those remain unidentified. The level of interaction and modification necessary to make formal tools demonstrates the closes association of these animals and Early Paleoindians. This chapter summarizes the nearly 250 formal bone and ivory tools found across North America. The intention is to be entirely inclusive of all published occurrences of formal osseous tools. Numerous tools that cannot be distinguished from naturally occurring breakage are intentionally excluded until conclusive evidence of human manufacture can be demonstrated.

Expedient Tools Excluded From Sample

Minimally modified expedient bone tools frequently appear to occur early in the cultural historical sequences of North America. Specifically, expedient bone tools are often thought to represent a pre-projectile stage of technological development (Bonnichsen and Sorg 1989; Bonnichsen and Turnmire 1991). Immediately Post-Clovis, across the continent, the osseous tool industries are flush with formal, recognizable tools that no one disputes (see Wilmsen and Roberts 1984 especially). Expedient, minimally modified (or non-modified) bone tools essentially disappear at the end of the Pleistocene in North America. Supposed bone tools are included in this sample only when there is clear evidence of human manufacture of some portion of the tool. In almost all cases at least one end, and usually the whole tool, is shaped into a form that clearly does not occur naturally. It is possible that this criterion excludes some real Clovis-age bone tools. It is preferred here to exclude some minimally worked examples than to include non-cultural aberrations from this gray zone. Until naturally formed pseudo-tools can be discriminated from weakly modified human tools by usewear or manufacturing analysis they must all be considered suspect (Dixon and Thorson 1984; Lyman 1984; and Myers et al. 1980). Even if some of the reputed expedient bone tools are real they cannot be included until they can be distinguished from naturally occurring breakage. One objective criterion that might help resolve some marginal forms is recurrence. If the same relatively complex pattern appears in unnatural numbers, in a probable cultural context, it might bear more careful consideration than a single odd piece.

Reputed flaked bone tools are an equally vexing set of "artifacts" as are the bone fragment expedient tools. The vast majority of reported osseous tools from Early Paleoindian assemblages meet the single criterion of being pointy on at least one end. At present the inability of researchers to distinguish natural from cultural formation processes of these tools is the most damning criticism. Vertebrate faunal assemblages dating earlier than the Rancholabrean are rife with examples of bones every bit as modified, in form and process, as many of the bone "tools" reported from some Clovis sites (*sensu* Johnson 1987).

Calling an item an "expedient" tool means overall modifications are minimal and does not refer to a specific tool function. Examples from Lubbock Lake, Colby and other sites are not clearly differentiated from naturally broken bones (Frison 1986; Johnson 1987). These equivocal tools lack any indication of human modification (Frison 1982:159). The lack of clear human modification presents an insurmountable problem in distinguishing naturally and culturally modified bone fragments.

The reputed flaked bone tools from Lange/Ferguson, South Dakota are critiqued for illustrative purposes. There are three possibilities regarding how the tools were acquired. First, they were carried in when the Clovis hunters arrived on site. Second, these elements were cut free from the first animal killed; this scenario is highly suspect as there is no reason to use an ineffectual blunt pelvis fragment to whack a single joint five times (Hannus 1989:402). This smash and split method is completely at odds with the rest of the bone and stone toolkit which is highly formalized and curated. Finally, they

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were found on site, which could be used to explain their uneven distribution/occurrence on the landscape because they are only fortuitously discovered. The second scenario is the one suggested by Hannus for the Lange/Ferguson bone chopper; it is not stated how the end of the femur was removed from the animal without the use of stone tools (Hannus 1989). All three scenarios are completely at odds with the patterned tool curation visible in unequivocally human made Clovis stone tools (and formal bone tools presented in this chapter) (Goodyear 1979). The identification of the flaked bone tool and mending bone flakes from the same loci is very difficult to accept as the product of human activity (Hannus 1989). Finished, utilized, and use-worn tools are not going to be found lying together with the refitting debitage removed in their manufacture. This is a senario that does not occur with stone tools either.

Early Paleoindians did not make expedient bone tools that can be proven to be human artifacts. Criteria for distinguishing natural and minimal human bone modifications are incapable of excluding naturally broken bone fragments from faunal collections that are millions of years old (Bonnichsen and Sorg 1989). For this reason alone, expedient bone tools are excluded from the Clovis tool sample.

It is further hypothesized that the regular utilization of exotic stone material for tools and the patterned manufacturing processes of the formal bone and ivory tools go far toward contradicting the need for expedient bone tools by Early Paleoindians. Clovis people stop at nothing to get high quality crypocrystalline stone, traveling up to 1800 km (Gramly 1999). It is logically inconsistent that such people will utilize second-rate expedient bone tools that are not clearly artifacts. The notion of expedient, informal bone tools being used by Clovis people is antithetical to everything else we know about their technological adaptation. Archaeologists generally agree that we can recognize a regular (albeit not exactly standardized) range of formal stone tools across North America (*sensu* Meltzer 1993:110). As more data accumulate regarding osseous industries it will become clear that the diverse range of osseous tools are every bit as formal as the stone tools (Hemmings et al. 2004; Pearson 2000).

The known formal bone and ivory tools from Clovis age sites discussed in this chapter are mostly shaped by grinding and require almost no technical skill to create. Even the slightest direct modification of bone by grinding is instantly obvious evidence of human manufacture. Further, manufacturing failure is almost impossible because of the specific performance characteristics of wet green bone (Johnson 1989 has extensive discussion of this issue). Osseous tool return on manufacturing investment is near 100%. It is possible that the circa 50% failure rate in fluted point manufacture (Ellis and Payne 1995) might only be tolerable because there already exists an alternative suite of reliable projectiles, albeit with partially overlapped ranges of performance characteristics.

Discrete Clovis Affiliation

The bone and ivory tools made from identifiable elements of extinct taxa were manufactured only by Early Paleoindian Clovis peoples. Nearly every formal bone tool included from outside of Florida was found in a context that clearly indicates Clovis affiliation. The majority of formal bone and ivory tools from Florida were recovered from stratigraphically deflated river bottom deposits. Several lines of evidence discussed in this section indicate that despite the contextual issues, the items manufactured from identifiable elements of extinct fauna are in fact diagnostic Clovis artifacts.

The prehistoric Florida sample was manufactured entirely of wet green bone and ivory. To test this proposition numerous bones from roadside finds of deer were collected, mostly from skeletons of freshly observed deaths. From the experimental manufacture of nearly 100 deer and horse bone tools it has been observed that bone only one year old is too brittle to produce reliable, functioning tools (Hemmings 2000; Hemmings et al. 2001). Even slightly dried bone will splinter in recognizable and predictable fashion. As these tools were clearly manufactured from fresh bone the contemporaniety of humans and extinct animals deserves comment.

Bones of extinct animals were not available to people after the Pleistocene extinction near the end of Clovis times (effectively 11,000 rcybp). If these bones were available for tool manufacture they should show up in Post-Clovis cultural contexts, which they do not. Further, if old bones were available they are only capable of producing ineffectual tools based on considerable experimental bone tool manufacture (Hemmings 2000; Hemmings et al 2001). Finally, robust osseous tool industries are known from Folsom, Bolen, and most other Post-Clovis Early Holocene archaeological cultures. The Post-Clovis bone tool industries differ in tool source material, tool form, and in most cases tool manufacturing processes.

Old bone is not available in Florida and is rarely found “fresh” outside of permafrost areas (Bonnichsen and Sorg 1989). The lack of available old bone is particularly noticeable in the acidic terrestrial soils of Florida. Even bones from underwater sites do not survive well once they are exposed to the water column. Protein denatures at warm temperatures no matter the preservational environment (Johnson 1989). Modern deer and hog bones are easily recognizable in the Aucilla as they are heavily deteriorated and brittle. Unless bone is buried by leaves or other anoxic sediments it will not survive in Florida's underwater environment. The suggested use of old bone outside of permafrost areas suffers from two glaring logical deficiencies as the least parsimonious explanation proposed: A unique, undefined mechanism of bone preservation must be demonstrated and ancient people had to be able to recover old bone, presumably from buried contexts at the bottom of Florida's rivers. Neither situation can be demonstrated and extinct Pleistocene faunal elements do not occur in any quantity in Post-Clovis sites as can be seen in Appendix 2. Because of its association with extinct fauna a single Goshen age artifact is included in this chapter despite not being made from an identifiable extinct animal itself (Frison et al. 1996).

A single item made of unidentified mammal bone from the Mill Iron Goshen component is included, as stratigraphic or chronologic separation of Goshen and Clovis is not yet clearly established (Frison et al. 1996; Bradley and Frison 1996:67). The mammoth rib tool handle from Mill Iron is not included because only rodent gnawing modifications can be seen in the illustration and no other clear indication of modification is visible (Bradley and Frison 1996:66). Because this pendant is not made from an identifiable element of an extinct animal it does not change the position explained below.

The conclusion that in North America the affiliation of artifacts made from extinct animals is with Clovis rests on several lines of evidence. First, the diet data set indicates that the extinct animals are simply not available after Clovis times, and secondly Bolen, Folsom and other post Clovis cultures utilize *Odocoileus* and *Bison* bone for a wide range of standard formal tools, none of which are manufactured from extinct animal elements.

The standardized manufacturing process for splitting, grinding, and shaping most of the formal Clovis bone and ivory tools in North America demonstrates a remarkable amount of cultural and technological continuity regardless of the context of discovery. Their manufacturing methods alone identify these osseous tools as diagnostic Clovis-age tools. Manufacturing consistency within Clovis time and across the whole continent contrasts sharply with changes in manufacture process, available tool stock animals, and form for all later cultural periods. Further, as the sample of known Clovis bone tools increases, fewer forms remain unique. These osseous tools from extinct animals are the product of patterned cultural behavior across the continent during Clovis times.

Early Paleoindian Formal Bone Tools Outside of Florida

Formal bone tools have been recognized as an integral part of the Clovis toolkit since the initial discoveries at Blackwater Draw in the 1930s (Cotter 1937; 1938). Numerous other finds from Florida and Alaska were compared to the Clovis finds shortly thereafter (Jenks and Simpson 1941; Rainey 1940:307). Several excellent summaries of Clovis bone and ivory tool occurrences have appeared over the years but the interpretations bog down in questions of function (Lyman and O'Brien 1998; Pearson 1999; Wilke et al. 1991). Several other summary papers have focused specifically on the issue of bone tool function (Bradley 1992; Frison 1991; Painter 1985). The primary issue that confounds the summary articles is that no one has examined and handled a large enough sample of these artifacts to effectively describe the variation. Particularly important is the realization that multiple tool forms are represented by the rods, points, and other more highly variable (and rarer) bone tool forms such as the well known

Murray Springs bone wrench (Haynes and Hemmings 1968). The variation among the forms has of course been discussed by the different authors, the difficulty has been to sort them into meaningful categories. The bone tools outside of Florida are described and later combined with all formal bone and ivory Clovis tools from North America in the section dealing with functional variation. That the bone and ivory tools were designed for numerous functions is a critical realization.

With the exclusion of the expedient pseudo-tools there are 93 formal bone tools left to examine from outside of Florida. All 93 tools are listed by site in Table 3:1. This classification of 93 tools represents a fairly inclusive case, because several tools that might be too young are included. Also, some sites such as Anzick have produced fragmentary tools that cannot be successfully mended and thereby create some uncertainty regarding exactly how many individual tools have been recovered (Lahren and Bonnichsen 1974; Wilke et al. 1991). Additional uncertainty exists because some tools are rather poorly published and/or not illustrated. The Burnet Cave and Fishbone Cave 5th horse metatarsal awls are the prime examples of this uncertainty (Howard 1935; Orr 1974). No clear human modifications can be directly seen in the published images but the form is very similar to examples made from deer ulna throughout the continent for more than 10,000 years. Those bone tools with some sort of uncertainty that are in need of further examination or of direct radiocarbon dating are marked with an asterisk in the frequency column.

Formal Early Paleoindian osseous tool have been found at 29 sites in 14 American states, and also Manitoba, Saskatchewan, and Mexico. This widespread distribution is shown in Figure 3:1. 10 states have produced multiple bone tools. Only six areas have produced solitary specimens. The most striking area of absence is the greater Northeastern United States. Only the two short bone points from Sheriden Cave and the ivory billet from the Trull site, TN have been found east of Texas and north of Florida (Norton et al. 1998; Tankersley 2002). By area nearly one half of the United States has not produced a single formal Early Paleoindian bone tool. However, much of this area was originally occupied by Gainey, or Clovis/Gainey, point producing people. Because of the lack of clearly associated extinct fauna with Gainey, it seems more likely that the lack of Early Paleoindian bone tools reflects changes in the technological adaptation – effectively this change is the cultural response to the changed environment in the Holocene after the extinction event.

As stated above, only two sites outside of Florida, namely Sheriden Cave, OH and the Trull Site, TN occur east of the Mississippi River and these have yeilded only three formal bone and ivory tools from Early Paleoindian contexts in the Eastern United States. Without doubt this paucity is a reflection of poor preservation rather than an indication of a technological change among Early Paleoindians in the east. The superior preservation in Florida's underwater sites certainly bears this out. Taking the conservative stance from the Table 3:1 artifact total (n=51) Sloth Hole alone has produced more formal ivory tools from identifiable extinct animal remains than the rest of North America combined (see Table 3:2 below). The variation in ivory and bone tool forms for all of the study area is discussed shortly after descriptions of the Floridian tool forms.

Brief discussions of important aspects of the artifacts in Table 3:1 attempt to highlight the less widely known bone tools from Early Paleoindian sites in North

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America. They are presented roughly in order of their discovery and publication in the archaeological literature, particularly for those found prior to 1940.

First came the contentious discoveries by Koch in the area of Kimmswick, Missouri in the late 1830s and early 1840s. Later the 1870 discovery, by Mariano Barcena at Tequixquiac, Mexico, of the *Palaeolama* sacrum carved to look like a coyote head should have settled the question of mankind's presence in North America during the Pleistocene prior to even the Trenton, New Jersey gravel age debate (Barcena 1882; Koch 1839; 1860; Meltzer 1993; Wormington 1957:200). Instead, the sacrum was lost until 1955 and it has not been mentioned since 1965 (Aveleyra 1965). The two holes drilled for the nasal passages are absolute evidence of human modification of this bone. This is best seen in Wormington's Figure 59 (Wormington 1957:201). At a minimum this is an important artifact as it was the only *Palaeolama* and human co-occurrence reported in the archaeological literature of North America from 1882 until 2001 (Barcena 1882; Webb and Hemmings 2001). If the sacrum is sufficiently well preserved it should be dated directly. The lack of contextual controls seem mitigated slightly by later work that indicate that at a minimum this was recovered from Pleistocene deposits (Aveleyra 1965). We now have the ability to determine if this is indeed a Pleistocene-age animal and an early human association.

In Potter Creek Cave, California numerous extinct animal bones were found with several (possibly as many as 10) long bone splinters, several with holes drilled through them, that were said to be intentionally smashed by "Early Man" (Putnam 1906). Because there were no stone artifacts present with the Pleistocene faunal assemblage the drilled pieces of bone are the only evidence of human association and utilization of these

Table 3:1 Formal bone and ivory tool locales outside of Florida.

Site Name and Location	**State**	**Tool Type**	**Frequency**
Anzick Cache	MT	Bone rods: 3 types? 11 items 4 comp.	5 to 7*
Arvilla	ND	Ivory or bone rod?	1
Blackwater Draw	NM	Billet, point, bead, awl, tusk, rod	1,2,1,1,1,2
Broken Mammoth	AK	Ivory points, Bone: bead, toggle	3 iv. 2 bone
Burnet Cave	NM	Awl, *Equus* 5th metatarsal	1?*
China Lake	CA	Ivory shim	1*
Crook County Cache	WY	Bone rods, foot long and finger thick	2
Drake Cache	CO	Ivory rod?	1?
East Wenatchee Cache	WA	Bone rods	14
Etna Cave	NV	Bone bead	1 age?*
Fishbone Cave	NV	Awl, *Equus* 5th metatarsal	1>?*
Gault	TX	Bone point tip	1
Goldstream/Tanana	AK	Bone points- too new now probably	2
Gooselake	CA	Bone rods?	6*
Grenfel Saskatchewan	SAS	Hoe or Point? Wilmeth68	1*
Jacob's Cavern	MO	Art on *Odocoileus* humerus	1*
Klamath Lake Lower	CA	Bone rods	11 age?*
Lac du Bonnet, Manitoba	MAN	Proboscidean 17" fibula tool	1
Manis Mastodon	WA	Bone point tip in rib?	1
McFaddin Beach	TX	Ivory (?) point tip	1
Mill Iron	MT	Bone pendant (Goshen) unpictured	1
Murray Springs	AZ	Bone wrench, bone point?	2
Navarette	AZ	Bone handle 1979 Huckell notes	1
Potter Creek Cave	CA	Drilled bones- ornaments?	4+?*
Sheaman (A.B. area 9)	MT	Ivory point	1
Sheriden Cave	OH	Bone points	2
Tequixquiac, Mexico	MEX	*Palaeolama* sacrum coyote art	1
Tranquility Site	CA	Bone point fragments A93 w/Clovis	2
Trull site	TN	Ivory billet (battered usewear)	1*
Wizard's Beach	NV	Ivory and bone tools, points	12?*
Totals:		9+ total forms	* irresolute
29 sites in 17 states and provinces (14 USA).		Points, rods, billets, art, wrench, awl, handle, beads, tusk discard	93 liberal, 51 certain

animals. Sellards and Wormington express split opinions among the archaeological community over whether these modifications were made by humans (Sellards 1952:123; Wormington 1957:164). Putnam's original photographs show numerous splintered bones, at least two of which have holes drilled in them that are not foramina (Putnam

1906:235 plate 8). The cortical bone thickness of most of these splinters eliminates most Holocene fauna from consideration. As in most of the uncertain cases in this section, advances in radiocarbon dating should allow for precise age determination and thorough microscopic examination should aid in determining if these holes are the work of humans at the end of the Pleistocene.

Jacob's Cavern, Missouri was a very hotly debated site from 1921 until the late 1940s. Original excavations in the site removed nearly five feet of occupied deposits over several seasons and then the site was abandoned (Gould 1903; McGuire 1904). The surface upon which Jay Taylor found eight perforated bones and a perforated shell in 1921 was older than anything seen by the Moorehead excavators in 1903 (Allison 1926; Taylor 1947:691). Only one bone did not disintegrate within a few years. This was a fragmentary left *Odocoileus* humerus found with two deer incised on one side and a mastodon carved into the other (Allison 1926). The age of the bone and the age of the drawings are still in question but this artifact cannot simply be dismissed (Nelson 1927; 1928). We should now be able to determine if cuts were made with stone or metal tool and the exact age of the specimen. One critical detail was never repeated after the initial report by Allison (Allison 1926:327). The face with the deer drawing also has the zigzag design that is repeated on the famous complete ivory point from Florida (see Haynes 1982; Hemmings 1999). Further, this design motif has been seen on other formal bone tools in Florida that await direct radiocarbon dating but because of manufacture and design similarities are believed to be Clovis tools.

All three uncertain cases discussed so far contained artifacts that were portable art or ornamentation. Because they have been long ignored in the literature, the widespread popular misconception exists that Early Paleoindians were not particularly artistic (Meltzer 1993; 2004). Several additional examples of Clovis art will be considered in Chapter 5. As we now ought to be able to accurately determine whether these are indeed Early Paleoindian artifacts, they are included in the sample until the question is answered.

Not surprisingly, the Clovis type site at Blackwater Draw, New Mexico leads the way with the most diverse assemblage of bone and ivory tools outside of Florida. Only Sloth Hole has more kinds of tools made from identifiable elements of extinct taxa. The two bone points and two bone rods are similar in form to several examples from other Clovis sites (Bouldurian and Cotter 1999; Cotter 1937; Hester 1972:110-117; Pearson 1999). The now lost, ivory soft hammer billet serves the same function as the Trull Site, Tennessee ivory billet but with a rather different form (Saunders et al. 1991; Norton et al.1996). Hester illustrates a bead (#937-86) and an awl (#2-123) that seem to have solid evidence of manufacture but direct examination would be very useful in making this determination certain (Hester 1972:114 and 112). The 70cm ivory semi-fabricate is an early stage ivory core fragment discard from the patterned tusk reduction sequence recently deduced after a second fragment of a tusk core was found in Florida (Saunders et al. 1991).

The Trull Site, mentioned above, contained a very unusual mastodon ivory billet. The highly deteriorated surface is disconcerting but the battered end appears similar to the wear seen on modern antler billets. The specimen is illustrated in Norton et al. (1998:50) and the reader is enjoined to determine the veracity of the claim on their own. The similar ivory tool from Blackwater Draw and an undescribed mastodon spinous process with a heavily battered end from Sloth Hole collectively indicate an unusual array of soft hammer percussion instruments employed by Early Paleoindian Clovis people.

The straight bone point from Goldstream in the Tanana Valley, Alaska is 24.2 cm long if Rainey's image is accurate (Rainey 1940:306). The drawing is rather similar to the Clovis examples and would have been a robust killing tool (Cotter 1937). Both points are illustrated by James Dixon (1999:53). The bifacial preform and lanceolate point or preform found nearby have Paleoindian affiliations. However, the recent direct dating makes them appear to be considerably younger than Clovis (Dixon 1999:53). They are retained in this sample for now, as the association with extinct fauna is unresolved and to further document the solving of an old archaeological mystery (Dixon 1999).

Another tremendously important Alaskan site is Broken Mammoth. Three ivory and two bone formal tools have been found here to date (Holmes 1996). The smallest ivory tool appears to have tip wear similar to the *Equus* daggers from Florida described below (Holmes 1996:318c). The bipointed ivory rod(?) has almost exactly the same dimensions as several of the East Wenatchee specimens (Holmes 1996:318d; Gramly 1993:52-57). It is likely they served the same unknown functional purpose. However, because it appears that prehistorically these tools were manufactured from old ivory direct dates place them thousands of years older than the context and other associated artifacts they were found with (Alaska Department of Natural Resources 2004). However, the directly dated ivory collagen was much closer in age to the charcoal dates (~11,500 to 12,000 rcybp) (Alaska Department of Natural Resources 2004). The tool manufacture date, manufacture process, and finished form are remarkably similar to Clovis examples from the continential United States even if made from relict ivory.

Several of the major Clovis cache sites included bone or ivory tools. Anzick, Drake, Crook County, and East Wenatchee are discussed in this section. Only Anzick and East Wenatchee contained multiple tools in good condition. Slivers of ivory which may have represented a tool were found with the stone points in the Drake Cache, Colorado (Stanford and Jodry 1988; Tankersley 2002). It appears that only one tool was represented but even this is far from clear as it was not reported in the literature (Stanford and Jodry 1988).

The Crook County Cache from Wyoming included two broken bone rods or "tent pegs as big as your finger and a foot long" according to the site discoverer Harold Erickson (Byrd 1997a:19; 1997b:38; Tankersley 2002:106). The pair of rods eventually deteriorated and were thrown away (Tankersley 1998). The minimal description sounds more like the Anzick and East Wenatchee forms than any others but unfortunately there are no further data available. These are included to mark both distribution and frequency of these diagnostic Clovis artifacts.

The Anzick, Montana burial contained three types of tools: thick and thin bi-beveled rods as well as a thick single-beveled, blunt-ended specimen (Pearson 1999:86; Wilke et al. 1991). There are a total of nine bone rod pieces, as well as two complete or nearly complete tools. The nine pieces could reasonably make three to five additional bone rods (Lahren and Bonnichsen 1974).

After Potter Creek cave was excavated several additional sites in California produced bone and ivory tools as well. Among the bones at one of the China Lake, CA sites an ivory "shem" was discovered (Davis 1975; 1978). Within the ivory workstation at Sloth Hole numerous wedge shaped slivers were recovered and this artifact sounds very similar and is therefore included until it can be examined properly (Hemmings 2000). Two bone point tips were found at the Tranquility Site, CA (Hewes 1946:212). Though rather blunt they appear to have been broken distally of the missing haft area and are remarkably similar in form (Hewes 1946:212 University of California Museum of Anthropology 1-51176 and Figure 28v- University Museum, Philadelphia A93). Artifact A93 was found on the "hard surface" with the base of an obsidian Clovis point (Hewes 1946:212). Other later point forms are present in the deposits, so direct dating of the artifacts would be optimal to determine their age (Hewes 1943, 1946). No report appears to have ever been published regarding this site, despite later excavation by others (Wormington 1957:232). At a site near Lower Klamath Lake Cressman reported finding long bone projectile points with horse, camel, and "elephant" among other animals (Cressman 1946:50). Wormington states that the bone tools are similar to the Clovis examples (Wormington 1957:185). Four points and two bi-beveled rods from Gooselake, California are included in Georges Pearsons dataset (Pearson 1999:86). Though presently undated, the occurrence of these two forms seems to be the hallmark of Clovis rod morphology. All of the California artifacts need to be properly illustrated, described, and if possible, directly dated.

Wheeler's (1942) report on Etna Cave, Nevada indicates a bone bead was found in the lowest of four cultural horizons with a concave based lanceolate point and several extinct animals. Though undated, the association seems plausible as a Clovis site; this notion is further supported by recent identification of ivory bead preforms in the assemblage from Sloth Hole. Until properly dated, however, the Etna Cave specimen must remain somewhat suspect.

The Wizard's Beach, Pyramid Lake, Nevada site contained as many as 12 bone and ivory tools. Most of the direct dates appear too young, such as an ivory tool dated 10,360+/-50 (UCR-3798). The 11 bone tools appear to be of similar age: one is 10,340 +/-50 (Dansie et al. 1988). However, ivory tends to date notoriously young and it might well be worth redating these specimens. Also, the supposed ivory point seems to have a patch of cortical bone near the tip suggesting that it is not ivory (digital photographs from Amy Dansie, personal communication 2002).

The fourteen complete and fragmentary bone rods from the East Wenatchee Cache are well described elsewhere (Gramly 1993). They are most similar to the examples from the Anzick cache. Of particular interest in the Chapter 5 section on Clovis art are the zipper designs on at least two of the bone rods (Gramly 1993). The function of these oversized bi-beveled rods is entirely speculative despite numerous attempts at explanation (Gramly 1993; Lahren and Bonnichsen 1974; Lyman and O'Brien 1998; and Pearson 1999; Wilke et al 1991).

There is only one positively identified ivory point that has been found outside of Florida. The Sheaman portion of the Agate Basin site (A.B. area 9) contained diagnostic stone Clovis artifacts and one straight oval cross section ivory point (Frison and Craig 1982). The illustrated broken tool is 20.3 cm long (Frison and Craig 1982:157). Based on the gentle taper at the distal break it appears that 3 to 5 cm of the tip is missing.

There is a single 13.3 cm tip of a bone or ivory tool illustrated in Long's (1977) McFaddin Beach, Texas monograph. This rather thick artifact appears to exhibit a particular polished sheen that is unique to ivory tools (Long 1977, figure 8g). When complete at roughly 20 cm this specimen's width would be similar to one Florida specimen that seems disproportionately thick (1.4 cm) for its 17.3 cm length. Further, 68 Clovis points had been found on McFaddin beach at the time this item was reported so there is a reasonable likelihood of it being contemporaneous with the Clovis material (Long 1977). Pending personal inspection it is impossible to determine bone from ivory for certain but due to extreme similarities to Floridian examples in form and contenance it is counted as ivory(?) for now. Melanie Stright (personal communication 2001) knows the author (Russell J. Long) and he is willing to allow examination of this item. Because of the material question and lack of meaningful context this artifact is in great need of verification through carbon dating. If complete the width would exceed 1.5 cm which is very large for an ivory point.

The second osseous point from Texas was found at the Gault Site (Hemmings 2004). This 7 cm point section was highly fragmented immediately after exposure during excavation. Conservation attempts have been less than satisfactory to date. This tool is particularly slender and is most like the straight ivory points from Florida discussed shortly. Microscopic examination shows conclusively that this is a bone artifact and not ivory

A particularly tantalizing report of ivory tools found with burials was mentioned by Sellards (Sellards 1952:138). The ivory tools were reported from near Arvilla, North Dakota, at a site in a gravel pit, by Albert Jenks in 1935 (Jenks 1935:6). Rather surprisingly no mention is made of these/this artifact in the 1941 article comparing ivory tools from Florida with those found at Blackwater Draw (Jenks and Simpson 1941). Arvilla Gravel pit seems to become the basis for the "Arvilla" cultural complex initially described by Jenks here as well (Jenks 1932). Some 400-800 burials are reported to have been found here indicating this may be a younger site. It is retained here tentatively until the actual age is determined.

The bone point tip embedded in a mastodon rib at the Manis Site, Washington appears to offer unequivocal proof of human predation of a mastodon (Smithsonian 1986). The bone is said to have been x-rayed but no comment regarding the results of examination are noted (Gustafson and Manis 1984). A disconcerting observation from the photograph in the Smithsonian book is that the point appears to have entered the rib through the interior of the body, although it is conceded that proper orientation is difficult from the cropped photograph (Smithsonian 1986:36). Because of the amount of controversy about the excavation and the date of the site, direct dating of the rib and tool would be the first step in determining the exact relationship of this mastodon and Early Paleoindians. Modern ct-scan equipment images at sub-1 mm intervals would allow graphic reconstruction of the bone pin tip that could be examined by all (*sensu* Mihlbachler et al. 2000).

Near Lac du Bonnet, Manitoba a proboscidean fibula tool 43 cm long was found (Leechman 1950:157). This artifact is fairly similar to a hoe/mattock proboscidean rib tool reported by Dunbar and Webb (1996:348). This object is clearly a manmade implement and sorely in need of direct radiocarbon dating, particularly as it was a surface find (Leechman 1950).

Another Canadian bone tool similar to the typical Floridian ivory points was found near Grenfel, Saskatchewan (Wilmeth 1968). The distal tip fragment is 20.7 cm long and its widest dimension is 1.5 cm which is rather thick when compared to most

Florida examples (Pearson 1999). Again, this is a tool rarely discussed in the literature and would surely benefit from a direct radiocarbon date (Cotter 1981:926).

The Murray Springs, Arizona bone wrench is an enigma within American archaeology. It has long been thought to be unique in the New World and bears passing similarity to numerous Upper Paleolithic artifacts (Haynes and Hemmings 1969; Klein 1973:81; Soffer 1985:366). The exact function of this tool is not known. Typically it is called either a shaft straightener or wrench. The interior of the hole has wear polish suggesting this is indeed a tool for making other tools. The Murray Springs bone wrench may not be unique. During excavation for his basement Pasquale (Pat?) Minachaic of Cochise County, Arizona, saw the picture from the Haynes and Hemmings Science article and stated workers found one while digging inside his house (Gary Haynes personnel communication 2003). While currently it must stand only as a rumor the story would be worth an attempt to verify it.

An unreported slotted bone handle fragment from the Navarette mammoth site in Arizona doubles the known Clovis bone tool sample for the state. Only 50 m east of the Naco site, a runaway mammoth, the finding of a hand held tool this close to an escaped mammoth is difficult to explain. The tool was manufactured from a mammoth spinous process or rib section (Bruce Huckell, unpublished notes). Each of these possibilities is represented by examples from Florida. The exterior portion of the tool is highly eroded but extensive wear polish is still visible. Full description and illustration of this rare form of Clovis bone tool is anxiously awaited.

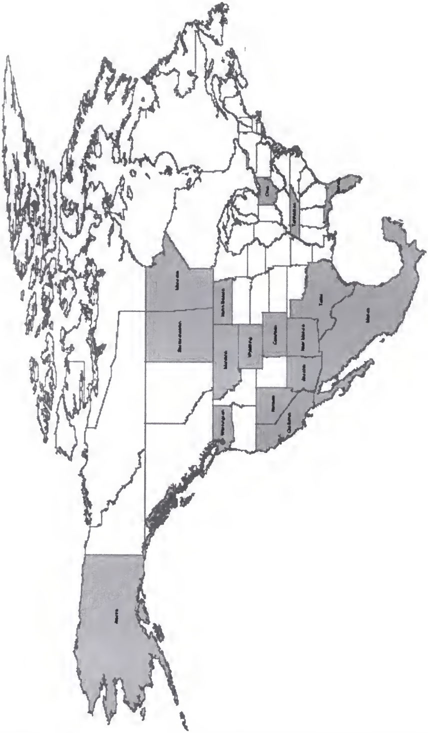

Figure 3:1 Distribution and concentrations of Early Paleoindian formal bone tools

There is one final site in the Eastern United States that contained two exceptional bone points. Sheriden Cave, Ohio has produced two short, straight bone points (Tankersley 2001; 2002). A puncture wound in a peccary scapula or pelvis closely fits the cross section of one bone point and may be direct evidence of peccary hunting with bone projectiles rather than stone Clovis points (Tankersley 2002).

The specific forms and deduced functions, when possible, of these tools are presented after description of the Florida bone and ivory tools made from identifiable extinct animal elements. In that section all Early Paleoindian formal osseous tools are combined for discussion.

Early Paleoindian Formal Bone and Ivory Tools from Florida

The original data from Florida compiled here graphically demonstrates how scattered the artifacts are and how long it takes to accumulate information. Ivory tools where first found in Florida in 1927 but not reported until 1941 (Jenks and Simpson 1941). Since then only a handful of Florida's ivory tools have been illustrated or described (Dunbar and Webb 1989; Haynes 1982). Since 1941, nearly 150 individual ivory tools have been seen by researchers working in Florida. The vast majority of these have been examined in the last 10 years by staff of the Aucilla River Prehistory Project. Formal ivory tools have been widely known to exist in Florida for more than 60 years and only now do we have enough information to treat them as diagnostic Clovis artifacts, a notion long held but not fully demonstrated until recently.

The geographic distribution of Florida's formal Clovis bone tools is somewhat restricted when compared to the ivory tool distribution. The limited sample size of the bone tool collection (16 versus 142) is, however, clearly intermingled and overlapping with the larger ivory tool sample. Dixie, Gilchrist, Hillsborough, Jefferson, Levy, and Oklawaha Counties produced the 16 formal bone tools made from identifiable elements of mostly extinct taxa. Dixie, Hillsborough and Levy have not produced ivory tools but account for five of the formal bone tools. Ivory tools have been found in seven counties. The distribution of these organic tools coincides closely with Jim Dunbar's data regarding lanceolate Paleoindian point distribution on and around the karst Ocala Uplift region of Florida (Dunbar 1991:193). The documented ivory tool sample has increased dramatically in Florida since Dunbar's 1991 chapter as well. His Table 1 identified only 21 ivory artifacts in Florida at the time (Dunbar 1991:198).

Summary statistics of Table 3:2 by County

Columbia	3 sites	4 ivory
Dixie	1 site	1 bone
Gilchrist	4 sites	3 (1i, 2b)
Hillsborough	1 site	2 bone
Jefferson	26 sites	98 (93i, 5b)
Levy	2 sites	2 bone
Marion	4 sites	10 (7i, 3b)
Suwannee	8 sites	16 ivory
Taylor	1 site	1 ivory
Wakulla	1 site	1 ivory

Notes on Selected Organic Tool Sites in the Aucilla River System

Several sites across Florida have produced multiple ivory tools, important suites of artifacts that include ivory tools, other formal tools made from identifiable elements of extinct taxa, and/or Clovis points. The distribution of all Floridian Clovis osseous tools was presented in Figure 3:2. Notice the close fit with that presented by Dunbar in his map of Paleoindian site distribution that selects heavily for better quality rock and

Table 3:2 Florida osseous tool sites

Site Name	**County**	**Tool Type**	**Frequency**
Aucilla ¼ Mile Rise B Waller	Jefferson	Ivory point	1
Aucilla Launch Above 98	Jefferson	*Equus* dagger, 2 holes	1
Aucilla Below 98 Bridge	Jefferson	Ivory points	2
Aucilla Above 98 Ward Isl.	Jefferson	Ivory point haft 6.83cm	1
Aucilla General, Ellis Moore	Jefferson	Ivory points	7
Aucilla Little River section	Jefferson	Ivory points	2
Bent Palm , L R Aucilla	Jefferson	Ivory point	1
Blackhole Cave Auc3a	Jefferson	Ivory point	1
Cypress Hole, Aucilla River	Jefferson	Ivory point	1
Fossil Hole, Aucilla River	Jefferson	Ivory points	4
Gerrell Site, Aucilla River	Jefferson	Ivory point	1
Glory Hole, Aucilla River	Jefferson	Barbed ivory point	1
Guest Mammoth Silver River	Marion	Ivory points	6
Hendrix Collection, Santa Fe	Gilchrist+	Atlatl hook, graver, flute, Iv core	4
Hillsborough R.+Fowler	Hillsborough	*Mammuthus* spine beamers	2
Ichetucknee 8SU-5	Suwannee	Ivory point	4 mend= 1
Ich. Bison Landing A ia	Suwannee	Atlatl hook from vestigial tusk	1
Ich. DOT landing A VIII	Suwannee	Square ivory shaft tool	1
Ichetucknee River A III	Suwannee	Ivory points	3
Ichetucknee River IV	Suwannee	Ivory points	2
Ich. Simpson Collection	Suwannee	Ivory points, awl=3+bannerstone	3, 1, 1, 1b
Ichetucknee Springs	Suwannee	Ivory point	1
Latvis/Simpson, L R Aucilla	Jefferson	Ivory point	1
Little River Rapids, Aucilla	Jefferson	Ivory points	3
Mandalay, Aucilla River	Jefferson	*Equus* daggers, Ivory points	2, 4
Mathen-Childers, L R Aucilla	Jefferson	Ivory points	2
May's Point, L R Aucilla	Jefferson	Ivory point	1
Page-Ladson, ½ M.R. Aucilla	Jefferson	Ivory points, Ma.Rad 60814	8,1
Powerline Site, Aucilla River	Jefferson	*Canis sp*? Jaw ornaments	2= 1 jaw
Ryan-Harley Site, Wacissa	Jefferson	Ivory point	1
Santa Fe River 1A	Gilchrist	Ivory point (W/cut Mc vert B70)	1
Santa Fe River Waller	Columbia	Ivory points	2
Santa Fe River atlatl	Columbia	Atlatl hook, made of ivory shaft	1
Silver River #2 General Run	Marion	Ivory points	2
Silver Springs Head 8MR59	Marion	Ivory points	2
Simpson's Flats Ich. R	Suwannee	Ivory points	2
Sloth Hole, West Run Aucilla	Jefferson	Ivory points, +5 other types	33(+67), +6
Steinhatchee River no#	Dixie	*Palaeolama* MT dagger	1
Suwannee River	Gilchrist	Ivory point	1
Suwannee 8GI1, 8SU2	Gilchrist	M.a. patella anvil 92-508-01 disk	2
Taylor Co. Aucilla River	Taylor	Ivory point	1
Totem Shoal, Aucilla River	Jefferson	Ivory points. Oval and round	7, 1
Waccasassa River #9	Levy	*Equus* tibia handle	1
Wacissa River	Jefferson	Ivory point	1
Wakulla Spring Run	Wakulla	Ivory point	1
West Run Aucilla River	Jefferson	Ivory point	1
Williams Landing 8TA1	Jefferson	Ivory point	1
Withlacoochee River	Levy	Proboscidean rib mattock	1
Totals:	3b, 2i, 4b & i	Bone N=15	142 total
48 Sites	10 Counties	13 ivory and 12 bone forms	N= 125 ivory

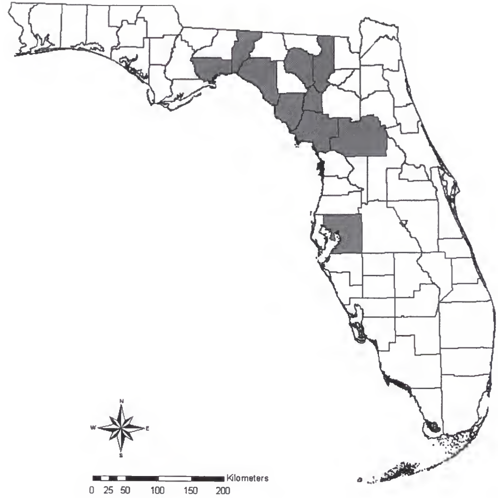

Figure 3:2 Florida formal Clovis age bone and ivory tool distribution by county

proximity to water (Dunbar 1991:189, 193). Several of the important Floridian osseous tool sites are briefly discussed below.

Aucilla River Unnamed Site, West Run above Highway 98, Jefferson County

Mike Hutto found an ivory tool haft end with a green break use fracture. It is 6.83 cm long and has a 1.1 cm maximum haft width, with a 1.31 cm maximum haft height. Height and width maximums were measured at the same point immediately behind the break.

Fossil Hole (8JE1497), Aucilla River, Jefferson County

Fossil Hole is an inundated quarry site with some habitation camp waste. A minimum of four ivory tool fragments have been found in surface assemblage (Hemmings 1999, 2000). This site has also produced some of the best direct evidence for the consumption of Vero tapir by Early Paleoindians, as discussed in the previous chapter.

Glory Hole (8JE1556/8TA287), Aucilla River, Jefferson/Taylor County

The 25 cm barbed, straight ivory point was found in two pieces with a green break across hafting element (UF VP cast #206412) (Hemmings 2000). Intact organic sediments remain along both banks and the bottom. This site should be considered of primary future interest.

Latvis/Simpson (8JE1500), Aucilla River, Jefferson County

An ivory shaft tool sliver was found in the surface assemblage of this underwater site, above the layers containing an in situ 32,000 year old mastodon (Hemmings 2000). A considerable bank of sediments, spanning the last 34,000 years of deposition is intact but it is unlikely that a terrestrial surface survives.

Little River Rapids (8JE603), Aucilla River, Jefferson County

Two fragments and one nearly complete ivory shaft tool were found in the surface assemblage of this underwater site (Hemmings 2000). This site is mostly a scoured limestone shoal with limited intact Pleistocene sediments along shore (Muniz 1998).

Mandalay (8JE1539/8TA147), Aucilla River, Jefferson/Taylor County

Two *Equus* left metatarsal "daggers" (UF VP #'s 206853 and 206854) and four fragments of ivory shaft tools were found in surface assemblage (Hemmings 2000). Dick Ohmes also found a parallel sided "Classic" Clovis point at this site (FL#2000-20-2-356). This site is highly disturbed and likely a great loss to the archaeological world.

Mathen-Childers (8JE604), Aucilla River, Jefferson County

An ivory point fragment is thought to be embedded in the mastodon distal left ulna (Hemmings 2000). This is not confirmed from examination of the mounted mastodon skeleton and no other likely bone has yet been re-discovered in the collections. Additional material is curated in the Vertebrate Paleontology range of the Florida Museum of Natural History that bears further research.

Page-Ladson (8JE591), Aucilla River, Jefferson County

Eight fragments of ivory shaft tools were recovered in the surface assemblage (Hemmings 2000). A mastodon left radius, abraded flat from utilization in the manner of a *mano* was also found (Dunbar and Webb 1989:489). Most dramatically, a complete tusk of *Mammut americanum* with numerous cuts across the width to free it from skull was found in October of 1993 (Dunbar and Webb 1996).

Ryan-Harley Site (8JE1004), Wacissa River, Jefferson County

One sliver of an ivory tool shaft was found in the surface assemblage downstream from the intact Suwannee artifacts. This author *does not* feel the artifact was directly associated with the Suwannee material (Hemmings 2000).

Sloth Hole (8JE121), Aucilla River, Jefferson County

A minimum of 33 ivory shaft tools with 69 additional non-conjoinable fragments and slivers known (Hemmings 1999, 2000). An ivory haft element found in intact late Pleistocene stratum (Unit 105 Level 5) was directly dated to 11,050 +/-50 rcybp (SL-2850). This is the first directly dated Clovis artifact from Florida and one of the earliest uncontested archaeological dates in eastern North America. Two drilled ivory "bead preforms" were also found here (*sensu* White 1993:284 fig.6). A fragment of an ivory "socket handle" was discovered in the surface assemblage (similar to Ackerman 1964, figure 14:6). The 3 cm tip of an ivory needle was found during the 1999 field season. A possible ivory barb has also been recovered, similar to the one described above. Additionally, more than 100 other forms of bone, antler, and tooth tools have been found in this one site. These include 1000+ deer bone pins in various size and morphological categories. One final probable artifact is a flaked proboscidean limb fragment with Ginsberg-like scratches that are either preparations for breaking it or were created from use as scraping device (Haynes 2002:145). Sloth Hole has produced six known Clovis points. One was removed from an intact stratigraphic sequence in the sidewall of a unit after fieldwork concluded in 1998.

Totem Shoal, Aucilla River, Jefferson County

A minimum of eight ivory shaft tool fragments, including the very rare oval cross section example discussed below, have been found in the surface assemblage (Hemmings 2000). This site should be considered of primary future interest as there are intact deposits of organic sediments.

Many of the 48 sites listed in Table 3:2 contain only a single ivory tool fragment in a surface assemblage that has been heavily collected over the years. The fragmentization of assemblage level collections creates an unreal illusion that every artifact is an isolated occurrence in Florida's underwater sites.

Formal Clovis Bone Tools of Florida in Taxonomic Order

Formal bone tools made from identifiable taxa and elements are individually described below. Seventeen formal bone tools are currently documented in the various public and private collections throughout Florida. The last three discussed are only assignable to the family *Proboscidea*.

Canis sp. mandible ornament

Both sides of a single canid mandible were found at The Powerline Site (no recorded site #), Aucilla River, Jefferson County by Joe Page and Mike Johnson in the summer of 1999 (FLMNH VP# UF206411). The Powerline Site is 400 m below the Highway 98 bridge in the main Aucilla channel. Both sides have been cast and consolidants applied. This undescribed specimen was briefly mentioned and illustrated in Webb and Hemmings (2001:7). One side was only weakly river stained and appears as though it might retain organic carbon. If it becomes possible this should be one of the first bone tools directly dated. See specific details of this discussion in Figure 3:3 *Canis* mandible ornaments.

Both sides are heavily modified, presumably for inclusion in a mask. The distal mandible portion containing the P2, P1, canines and incisors has been cut 2 to 3 mm in front of the P3 (referring to Olsen 1964:44). This cut was then polished, a pair of vertical grooves cut and a small hole drilled for attachment. The cut grooves and drilled hole only survive on the right mandible. The entire length of the ventral dentary surface is ground smooth on each specimen, nearly a centimeter of bone is missing below the articular process. The angular process has been entirely ground off on each specimen. The outer margin of the ascending ramus is greatly reduced by grinding on each mandible. The right M2 and M3 have been removed and drilled through to the bottom of the mandible for attachment. The left M2 remains but the M3 socket hole is drilled straight through. In sum, both mandible sides are cut and ground all the way around and have two holes drilled for attachment.

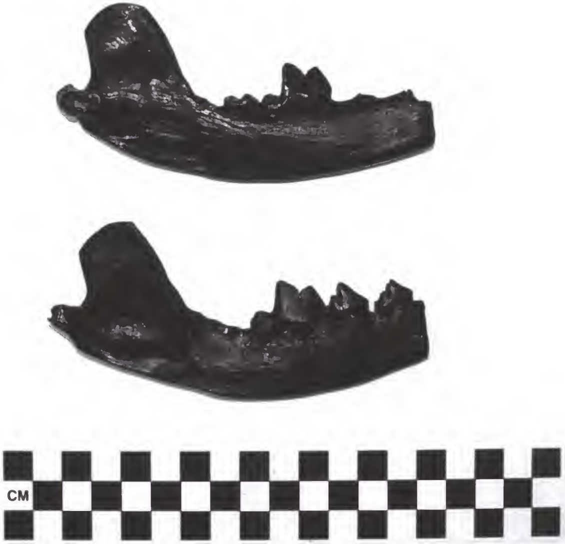

Figure 3:3 *Canis* mandible ornaments

Similarly cut and ground mandibles of deer have been found in the Aucilla of unknown cultural affiliation and function. The Aucilla deer examples are cut after the P2 and again after the last molar. The bottom and ends are then ground into what is colloquially referred to as a canoe. Essentially the remaining bone is canoe shaped with teeth for passengers. A bear maxilla cut to form a bone tang containing the incisors and canines was found at the late prehistoric Ripley Site in New York (Sullivan 1996). Cut mandible sections containing the premolars and canine of a black bear were recovered in the Harness Mound Group of Ohio (Mills 1907:). Other carnivores are used for similar aged artifacts as well (Mills 1904; 1919). It appears from these later examples and the modifications to the *Canis* specimens that the placement of the cut between the P2 and P3 is important for both the creation of inserts for a human mouth (canines and incisors) as well as using the premolars and molars as part of a headdress.

Assignment of this specimen to *Canis dirus* is tentatively suggested for this juvenile individual. Measurements for dire wolf teeth comparing populations from Rancho La Brea and San Josecito Cave were given by Kurten (1984:224). Length and width measurements of the M1 are compared to those obtained from the casts:

Dire wolf M1 range of Width and Length:

Powerline left	.99 w	2.40 l	41.25%
Powerline right	.99 w	2.48 l	40%
Canis dirus smallest	1.18 w	3.15 l	37.4%
Canis dirus largest	1.63 w	4.02 l	40.5%

The M1s measured in the cast are somewhat thinner and shorter than known dire wolf dimensions but width/length proportions are close, albeit on the high side (i.e. this individual is too thin for the length). The teeth are the fully erupted permanent set yet exhibit virtually no wear. Casts were compared to the mandible of a living 52 kg (115 lb) timber wolf approximately two years old. Even with the extensive grinding this mandible dwarfs a 52 kg wolf. If this mandible is *Canis lupus* it is nearly the largest gray wolf ever recorded. *Canis lupus* size ranges are variously reported as up to 46 kg, 26-59 kg (57-130 lbs), and 20-80 kg (80 kg is 176 lbs) (Collins 1959; Whitaker1994:539; Nowak and Paradiso 1983:952, respectively). In all likelihood this is a *Canis lupus* mandible but it is an extremely large young specimen manufactured in the same fashion as other known Clovis bone tools. Because of the manufacturing technique and the possibility of directly testing its age it is included here.

Palaeolama mirifica metatarsal "dagger"

A single unfinished "dagger" made from a *Palaeolama* metatarsal has been examined from an unknown site in the Steinhatchee River. Figures 3:4 is the only photograph currently available. The distal articular surface has been entirely ground away. The bifold groove of the anterior face (Figure 3:4) has been ground or buffed nearly smooth. Raised bone on the posterior lateral edges has been ground nearly flat with the face of the diaphysis (vascular groove). The pointed tip retains the bony divider of the marrow cavity. There does not appear to be any other modification to this metatarsal. The manufacture by grinding and seemingly intended form are consistent with other Clovis bone tools from Florida.

This may be a complete tool in its present form. If this is a finished tool no functional interpretation is currently suggested. Because it is so similar to the *Equus* daggers, it is thought this tool is not finished.

The use of an identifiable *Palaeolama mirifica* element is doubly important for both adding a new tool (or tool form) to the Clovis toolkit and being the first unequivocal evidence of Early Paleoindian utilization of a camelid known in the United States.

***Palaeolama mirifica* proximal phalanx atlatl hook**

Dr. Alvin Hendrix recovered an atlatl hook manufactured from the proximal phalanx of *Palaeolama* at Santa Fe 1A in the Sante Fe River, Gilchrist County, Florida in 1970 (Hendrix #694). The distal end has been ground slightly to isolate the bone spur used to seat the butt of a spear (Figure 3:6). Total length is 8.7 cm. The 0.68 cm bone spur has a highly visible burnished polish from repeated contact and launching of spears. This spur polish is entirely consistent with numerous antler atlatl hooks from several sites in the Aucilla River. Future microwear and replication use-wear studies are planned to examine the polish formation in more detail. The proximal end and posterior side cortical bone have been ground through, exposing a large portion of the medullary cavity 2.34 cm long. The removal of the posterior side made it possible to haft the atlatl hook in a raised position in relation to the longer atlatl itself. Width of the ground articular end is 2.7 cm. Thickness of the proximal end is 1.78 cm because of the grinding. The diaphysis after the large hole is 2.05 cm thick.

This artifact is remarkably well preserved in appearance and has been submitted to Stafford Labs for direct radiocarbon assay by the CAMs method. The date will be important for being a suspected Clovis artifact (namely, the earliest atlatl yet found in North America); and for being an extremely rare piece of evidence of Clovis utilization

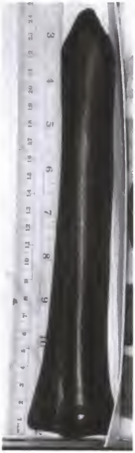

Figure 3:4 *Palaeolama* metatarsal dagger anterior view

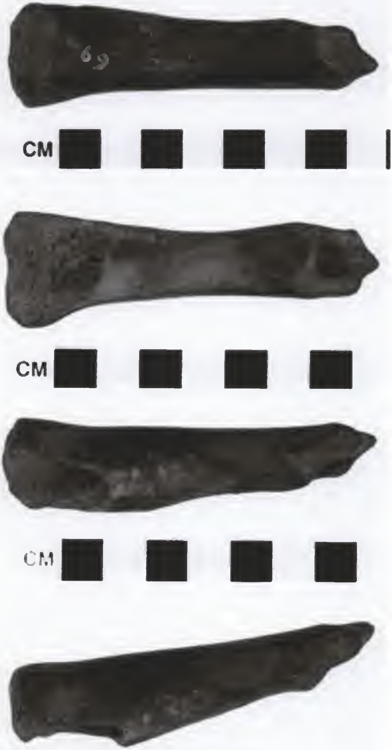

Figure 3:5 *Palaeolama* proximal phalanx atlatl hook

of camelids. Additionally, this individual will likely be among the very latest occurrences of *Palaeolama* in North America.

Odocoileus virginianus **metacarpal "flute"**

Despite being from an extant species, a single deer bone tool is included in this list because of its Clovis manufacturing similarities. It is currently being directly dated because of its superior organic preservation.

Figure 3:7 illustrates all four sides of the distal half of a deer metacarpal found by Alvin Hendrix in the Sante Fe River (Sante Fe 1A area), Gilchrist County, Florida. This incomplete tool fragment is 8.76 cm long. The cortical bone on all sides, including the articular end, has been ground deep enough to expose internal cancellous material. Two holes have been drilled inline on the anterior diaphysis. The second hole is where the break occurred and is difficult to see without direct light.

This style of extensive shaping by grinding seems to be a uniquely Clovis manufacturing technique in North America based on examination of the Floridian examples and most of those from the rest of the continent. Further this fragment of a tool is nearly identical to Upper Paleolithic Solutrean cervid flute examples on display at the American Museum of Natural History (probably *Rangifer*). Because of its fragmentary nature, functional speculation should be considered tentative. It is worth mentioning that this might also be a game call. Overall morphology is similar to Anasazi calls and whistles (Payne 1991).

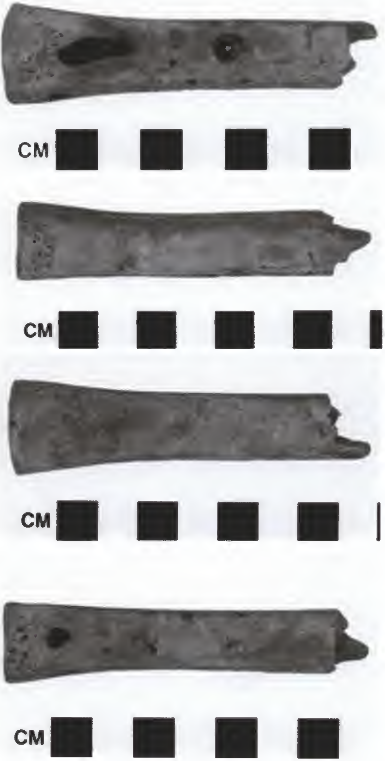

Figure 3:6 *Odocoileus* metatarsal flute

On its own, direct evidence of deer utilization by Early Paleoindians during the Pleistocene is uncommon. No other deer bone tools are presently known absolutely to be of Early Paleoindian age. Direct dating of likely specimens, particularly from Sloth Hole, should eventually demonstrate their antiquity at least in Florida. If this metacarpal artifact is indeed a flute it is likely be the earliest musical instrument in the New World. Directly dating this artifact will have far reaching implications in a number of disciplines.

***Equus sp.* tibia socketed handle**

This item was previously described and illustrated by Dunbar and Webb (1996:344). FLMNH Vertebrate Paleontology specimen #16822 is the distal half of an *Equus sp.* tibia that has 33 lapped flakes removed around the broken diaphysis mid-section. It was found in the Waccasassa River, Locality #9, Levy County, Florida, by Robert Armistead and donated to the museum in 1966 (Dunbar and Webb 1996:343). The marrow cavity has been cleaned and expanded to accept insertion of another tool into the handle. The exact nature of what this tool looked like when complete is unknown. This specimen is likely too fossilized to be dated directly.

***Equus sp.* metatarsal daggers**

Three examples of this type of tool are known from the Aucilla River, Jefferson County, Florida. The tip of a possible forth specimen is in the collection of Paul Lein, Tampa. Dr. Richard Ohmes recovered two in the surface assemblage of the Mandalay Clovis Site (8JE1539/8TA147) (FLMNH VP# 206853 and 206854). These two are illustrated in Figure 3:8. The third complete specimen was found at the Aucilla Launch

Site 1 just north of the Highway 98 bridge in the Aucilla River by Michael Johnson. The three specimens are nearly identical with a minor difference in the Johnson artifact mentioned below.

Metatarsal identification to the genus level of *Equus* was determined after extensive comparison with other elements and animal species in the Florida Museum of Natural History's Vertebrate Paleontology collection. Mammalian cortical bone of several sloths, bear, deer, bison, mastodon, mammoth and human was either of improper thickness or was not straight for the 20+ cm required to make these tools. *Equus*, *Palaeolama* and *Hemiauchenia* metatarsal became the only reasonable choice left. The camelids are clearly excluded on the basis of their having a bifold groove that runs the length of the metatarsal diaphysis. The groove on the surface of the bone would be plainly visible. Only *Equus* metatarsals have the topographic features observed on the surface of these tools and the proper cortical bone thickness. The presence of foramen on the daggers further helped orient them. The topographic contours of the tools indicate that the dagger tip is proximal and the drilled base distal within the metatarsal.

The articulating ends and posterior diaphyasis are entirely ground away on each specimen. The daggers are made from the anterior diaphysis shaft of the metatarsal. The Ohmes collection specimens have a single hole drilled near the base of the tool. The Johnson specimen has two holes drilled inline with each other. The speculative designation "dagger" is not intended to describe how these tools functioned. It is entirely possible these are weaving implements rather than part of the Clovis hunting kit.

The more complete specimen in Figure 3:8 is 23.9 cm long and 31.6 cm wide at the complete section above the drilled hole The height of 2.43 cm was measured at the

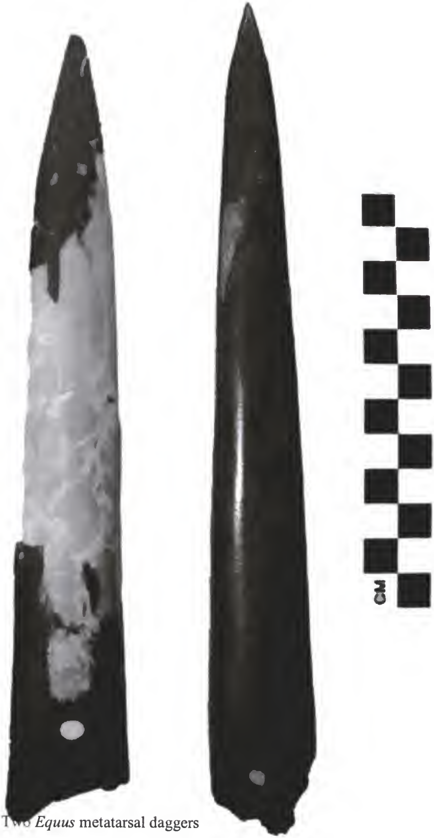

Figure 3:7 Two *Equus* metatarsal daggers

same point. The reconstructed specimen is 22.9 cm long, 3.6 cm wide and 1.35 cm tall at the same location the width was taken. The base of each is incomplete or they are broken. No clear hafting area is present. Presumably they were hand held and stored on a thong loop.

An experimental *Equus* metatarsal dagger was made by hand grinding a modern Quarter Horse bone for just less than three hours. A novice grinding a dry bone establishes the upper maximum amount of time production of this tool could possibly take. Both articulating ends were removed in less than 12 minutes of work. The ground cortical walls, or rails on the side exposing the internal trebecular bone, of the archaeological specimens closely match those produced on the experimental dagger by using a fresh greasy *Equus* metatarsal. The spongy, greasy (or wet bone *sensu* Johnson 1987) metatarsal did not splinter but rather absorbed the force of the grinding which produced striations on the ground surface. An earlier grinding experiment with a dry bovid metacarpal was aborted because the same forces splintered the bone in predictable and catastrophic fashion (i. e. the tool would crack and the maker would be pierced by bone splinters). This patterned brittle bone breakage has been observed on numerous *Odocoileus* metatarsal splintered manufacturing failures as well. There is no possibility that old bone was used to manufacture the *Equus* daggers or any of the other Floridian organic tools discussed in this chapter.

Evidence of clear interaction between Early Paleoindians and Equids is rare. These bone tools provide the most unequivocal evidence of their co-occurrence and direct utilization yet known. Because the Ohmes artifacts were coated with varnish prior to drying the outer cortical surface is delaminating. This deterioration has the unexpected benefit of exposing unstained, sub-fossil bone that might be suitable for radiocarbon dating. Direct dating of the longer dagger (#206853) will document very late Pleistocene horses and early humans in Florida.

***Mammut americanum* patella anvil**

A highly modified mastodon patella was found in The Butler Site (8GI1/8SU2) on the Suwannee River side. It is housed in the Bureau of Archaeological Research's collection (#92-508-01). This artifact was described by Dunbar and Webb (1996:337) as an anvil. The additional possibility of use as a hammerstone is suggested here. The battered scars are not clearly from giving (hammerstone) or receiving (anvil) crushing blows. The point is simply to establish that we might have found a highly unexpected form of soft hammer billet. It should be noted that the damage to the patella is largely shallow cuts that might be more indicative of anvil use, possibly for indirect percussion.

The Butler site is located at the confluence of the Suwannee and Santa Fe Rivers and may well have been the most important Paleoindian site discovered in Florida. Ben Waller claimed to have found hundreds of Paleoindian points in this stretch of the Sante Fe River. Waller told James Dunbar that he had 125 Suwannee, Alvin Hendrix had 125 Suwannee, and Cal Gouchenour had 70 Suwannee from the super dense concentration of points along the Lower Santa Fe River (Dunbar 1991). These totals clearly include some Clovis points. Further, several ivory tool fragments discussed shortly were recovered here. The Butler site is the only site in Florida known to have produced two forms of extinct animal tools. A proboscidean bone disk from here is described below.

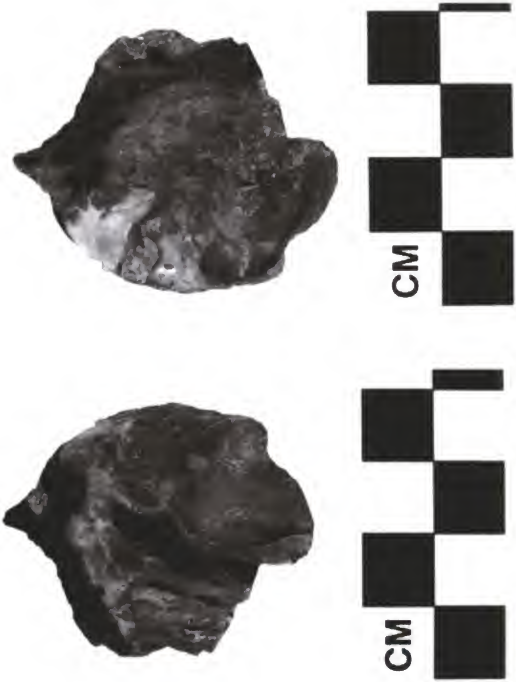

Figure 3:8 Mastodon molar fragment unifacial graver spur

Mammut americanum molar unifacial graver spur

This is the only Early Paleoindian artifact manufactured from an extinct animal tooth known in North America (see Figure 3:8). A Middle Paleoindian *Bison antiquus* molar from the Folsom layer at Lubbock Lake, Texas was cut to form an atlatl hook and other similar Folsom-age tooth artifacts are known on the Plains (Johnson 1987; Wheat 1977; 1979). This mastodon tooth graver spur was recovered in the Sante Fe River (Sante Fe 1A area) by Alvin Hendrix. A sliver of a molar cusp was marginally knapped on the enamel to isolate a graver spur exactly like other Early Paleoindian stone examples (Purdy 1981; Tankersley 2002). The tool is generally orientable: the graver spur is nearer the top of the cusp and adjacent portions of cementum and dentine form the grasped portion of the tool. Several small flakes were unifacially removed from the enamel to create the graver spur, eight on the left and three on the right. Macroscopically visible use polish is restricted to the tip of the spur and warrants future microscopic investigation.

Dimensions of the mastodon tooth fragment are: length 4.31 cm; width 3.42 cm; maximum thickness 0.88 cm; and the graver spur length is .66 cm. A total of 11 flakes have been unifacially removed from the external surface of the enamel.

Mammut americanum radius beamer

A single ground mastodon radius, 25 cm long, was recovered from Page/Ladson (8JE591), Aucilla River, Jefferson County (FLMNH VP# UF60814). Dunbar and Webb (1996:333) characterized this artifact as modified from wear, rather than technologically modified. Essentially the bone was ground smooth from use on the anterior face (convex side) (Dunbar and Webb 1996:333). They suggest as much as 1.4 cm of cortical bone had been ground off of this radius section causing the thinned wall to crack and the tool to break. Experimental use of a bovine metapodial produced similar patches of striations using a chert cobble as an anvil for grinding nuts (Dunbar and Webb 1996:336). This tool appears to be saturated with consolidants and direct dating is likely impossible at this point.

Mammuthus columbi spinous process beamer

Two examples of heavily ground mammoth neural spinous processes were found upstream from the Fowler Bridge Mastodon site in the Hillsborough River, Hillsborough County. Casts in the FLMNH Vertebrate Paleontology range are numbered UF137874 and UF160782 (Dunbar and Webb 1996:340). There is an unsubstantiated rumor that a third example also exists. Both have had the posterior surface ground completely smooth, stopping just at the point internal cancelleous bone became visible. Dunbar and Webb (1996:342) suggest use most similar to hide working with a fine abrasive.

Proboscidean Rib Mattock

A single proboscidean rib artifact found in the Withlacoochee River, Citrus County, downstream from the Highway 200 bridge was reported by Dunbar and Webb (1996:345) (FLMNH VP#136492 cast). The ball end has been entirely chopped away leaving a pointed implement 31 cm long. The sharpened tip is 3.5 to 4 cm long. Lateral thinning extends 12.1 cm from the tip. Only the proximal portion of the rib was recovered. The tip and rib shaft are smoothly abraded for about 6 cm. This abrasion

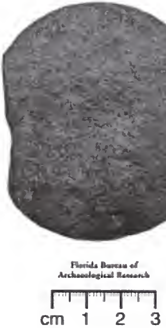

Figure 3:9 Proboscidean bone disk

appears to be the result of heavy utilization as a digging implement in sandy soil (Dunbar and Webb 1996).

Proboscidean bone disk

This is the second formal bone tool made from an extinct animal from the Butler Site, Santa Fe River, Gilchrist County (8GI1/8SU2). Figure 3:9 illustrates one side of a heavy cortical bone disk 6.8 cm in diameter. The cortical bone thickness combined with the lack of visible cancelleous trebecular bone limits the source animal to either mastodon or mammoth. It is not possible to determine which proboscidean or element this artifact was manufactured from at this time.

This bone artifact is preserved well enough that a direct radiocarbon date may eventually be possible. At present this artifact is considered highly important as a rare example of portable Early Paleoindian art. Very similar disks of mammoth bone were recovered in a dwelling at Mezhirich, Ukraine, an Upper Paleolithic site (Pidoplichko 1998). The supposed lack of such portable art is argued to separate Clovis people from possible Upper Paleolithic predecessors who manufactured a plethora of artistic items (Meltzer 1993a).

Mammalian bannerstone (proboscidean vertebrate centrum most likely)

This item is tentatively suggested to be an Early Paleoindian bone tool. It is a bannerstone from the Ichetucknee River, Gilchrist County, curated in the FLMNH Anthropology Simpson Collection (UF Anthropology #102603, Simpson #A-238). Figure 3:10 shows the prehistorically mended bone bannerstone as currently repaired.

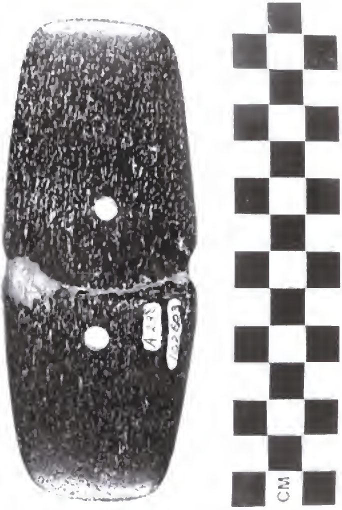

Figure 3:10 Proboscidean? bone bannerstone

General dimensions are as follow: length 13.47 cm, maximum thickness 1.5 cm, and is maximum height 5.39 cm (both sides of hafting hole are equal). Height at the hafting hole is 5.03 cm. The bannerstone tapers gently towards the ends in both height and thickness (left is 0.69 thick, height 4.81 cm; right is 0.74cm thick, height 0.74 cm). The mending holes taper from back to front (left 0.713 to 0.693 cm; right 0.86 to 0.582 cm). The left hole is almost parallel sided and quite cylindrical. The right hole is 3 mm out of true in 1.3 cm of distance or thickness, it is roughly conical compared to the left cylindrical hole.

Solid, cancelleous trebecular bone is visible on every facet of this artifact. No cortical bone or open cavity survives. The elongated oval bubbles of mammalian bone are clearly visible throughout. There are a very limited number of possible bones that cancelleous bone this thick could come from. The most likely source is the centrum of a proboscidean vertebrate. No other taxon has a bone that would satisfy both the length and width non-cortical requirements.

The drilled mending holes would have been used to tie the artifact to itself around the hafted handle through the haft hole. Because both sides of the prehistorically damaged bannerstone were found it seems highly unlikely that this artifact was tossed or washed into the Ichetucknee River. Because it was likely exposed in or near situ and the source bone was likely proboscidean this artifact is included with other Early Paleoindian bone tools despite some general misgivings. Surficially this bone appears to be sub-fossil, indicating that there is not likely to be sufficient organic carbon preserved to date this item directly at this time.

Formal Ivory Tool Forms Recovered in Florida

A wide range of formal ivory tools made from have been found in Florida since their initial discovery by the Simpson family in 1927 (Jenks and Simpson 1941). The 13 forms represented by 146 individual artifacts are described below.

Mammut americanum vestigial tusk atlatl hook

A highly modified mastodon vestigial tusk was found at the Bison Landing site in the Ichetucknee River by Larry Roberts (FLMNH Anthropology #A-4080) (Figure 3:11). This is the only known vestigial tusk artifact in North America. The ivory is rather leached and not likely to contain sufficient organic carbon for direct radiocarbon assay. In the future an attempt to directly date this artifact should be made simply for the importance of demonstrating an additional Clovis atlatl association.

The length is 5.17 cm. The maximum width of 1.76 cm is distal to the scored hafting area. The scored hafting area on the top is 2.25 cm long. The tusk was split longitudinally prior to being scored for hafting, the thickness within this groove is 0.71 cm. From the proximal tusk base the artifact is slightly beveled so the atlatl spur tip would be elevated above the handle of the atlatl when hafted. Thickness from the proximal to distal end varies: 0.87 cm thickness at base; 1.1 cm thick at distal end of scored haft; and 0.74 cm thick at the spur tip, which has a missing piece that makes this measurement inconsequential. The bottom is tapered so that when placed on a flat surface the tip lifts up nearly 0.3 cm to facilitate contact with the dart butt. The scoring for hafting was cut only on the top surface exactly like the ivory shaft fragment atlatl

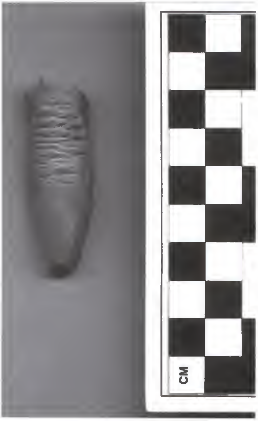

Figure 3:11 Mastodon vestigial tusk atlatl hook

hook below and several other antler atlatl hooks from the Aucilla River. The end of the spur has polish consistent with that observed on the other antler atlatl hooks as well.

Proboscidean ivory shaft fragment atlatl hook

David McCracken found an ivory shaft fragment that has been reworked into an atlatl hook in the Santa Fe River, Columbia County (FLMNH VP #123719). The 1.3 cm diameter of the shaft is on the large size but not unusually so. The overall length is 7.52 cm. The carved atlatl spur is 1.13 cm. A hafting area 3.5 cm long was carved out of the bottom of the shaft (see Figure 3:12). Directly opposite the haft area is a scored section designed to prevent slippage of the binding on the top of the atlatl hook. The scored area extends 4.1 cm from the base towards the spur tip.

This hook was shaped to elevate the spur tip for contact with the dart base, like the others. The polish on the tip, hafted elevation of the tip, and hafting mechanism are consistent with observations of other known atlatl hooks from Florida. Considered together the *Palaeolama* phalanx atlatl hook, mastodon vestigial tusk atlatl hook, mammalian bannerstone, and proboscidean shaft atlatl hook provide compelling direct evidence for atlatl use by Early Paleoindian Clovis people. Old World examples of atlatl hooks date to at least the Magdalenian and are usually more ornate, such as the reindeer horn hook carved to represent a mammoth (Peake and Fleure 1927:79).

Proboscidean tusk core fragment

The pecked, girdled, and snapped center of a proboscidean tusk was found in Site 1A of the Santa Fe River by Alvin Hendrix, in 1975 (Hendrix #3239) (Figure 3:14). The

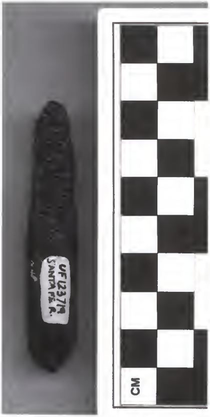

Figure 3:12 Ivory shaft fragment atlatl hook

cementum surface and thick outer rings of dentin have been removed leaving the center of the tusk containing the densest, most tightly packed ivory. This center would have been slightly larger than the head of a baseball bat and possibly up to 65 cm long. This is the area down the center of the tusk anterior to the pulp cavity and posterior of the pinched tusk tip.

This piece of highly modified ivory is the discarded internal portion of the tusk tip. This artifact appears to represent one or two stages farther along in the tusk reduction sequence first suggested for the 73 cm ivory semi-fabricate found at Blackwater Draw (Saunders et al. 1991). The proposed reduction sequence diagram appears to be correct based on a second stage of reduction being discovered (Saunders et al. 1991:117). Further, the Hendrix Collection artifact appears to have been "husked" after the pecking and breakage of the oval center as the pecking does not appear on the surface of the outer layer of dentin. This observation might indicate that there is an unseen intermediary step between the Blackwater Draw semi-fabricate and the Santa Fe 1A Site core fragment artifact. This unseen step would involve pecking and girdling the distal end of the Blackwater Draw tusk section and then peeling off the cementum and outer dentin layers, thereby leaving only the desired center of the tusk for tool manufacture.

Maximum length of this cone shaped artifact is 16.25 cm. The outer diameter is 3.79 cm immediately distal of the pecked area. The oval shaped remnant that was snapped when weak enough is 1.77 by 1.42 cm. The Blackwater Draw tusk center was noticeably larger in diameter when snapped (~3.5 cm see Figure 3, Saunders et al. 1991:116). These two artifacts indicate a fairly straightforward manufacturing sequence for the better known dense ivory points so numerous in Florida.

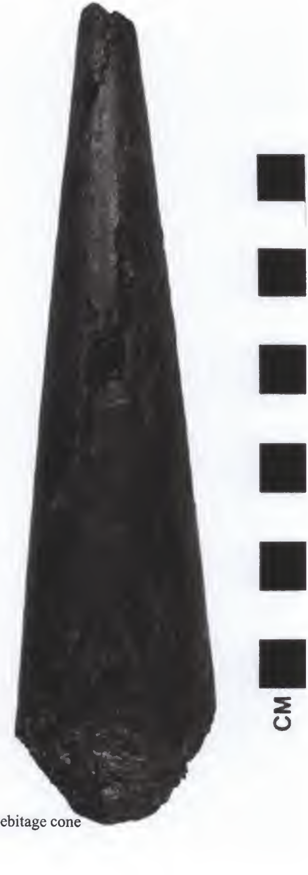

Figure 3:13 Tusk core debitage cone

Proboscidean ivory socketed handle fragment

A fragmentary portion of a socketed ivory handle was found in Sloth Hole, Aucilla River, Jefferson County, in 1999 by the ARPP. The exterior portion is shown in Figure 3:15. Florida's rivers have produced numerous complete "sockets" made from deer antler that are remarkably similar to this ivory artifact.

This section of the socket wall is 3.06 cm long. The width of the fragment tapers away from the lip of the cup: 2.28 cm at the lip; 2.1 cm in the middle of the fragment; and 1.03 cm at the abruptly broken end. These three measurements document the shape of this fragment but do not help describe the original form of the object. The thickness of this artifact is nearly uniform (0.38-0.42 cm). Manufacture evidence is only visible on the highly polished exterior of the tool, which is not natural to ivory. Chop marks from a stone tool on the top lip are the other observable manufacturing modifications. The socket fragment has approximately 60 degrees of curvature, or 1/6th of the diameter of the complete tool. A tool made from fossil ivory of similar design was found at a later site in Alaska (Ackerman 1964, figure 14). No function is clearly discernable, but there is a passing resemblance to thimbles.

Proboscidean ivory bead preforms

Two small pieces of ivory that appear to be drilled have been recovered from the surface assemblage of Sloth Hole (8JE121) (Figure 3:15). Both are broken across the hole and do not appear to be finished artifacts. A small section of ivory was obtained and a hole drilled through each. The hole is straight and not tapered as is generally expected from use of a graver flake or other stone tool. The possibility that these are not artifacts

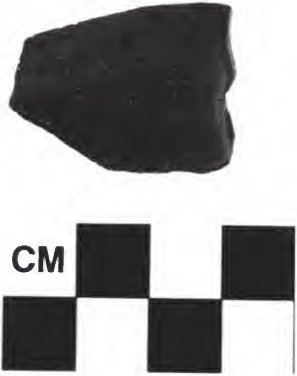

Figure 3:14 Ivory socket handle fragment

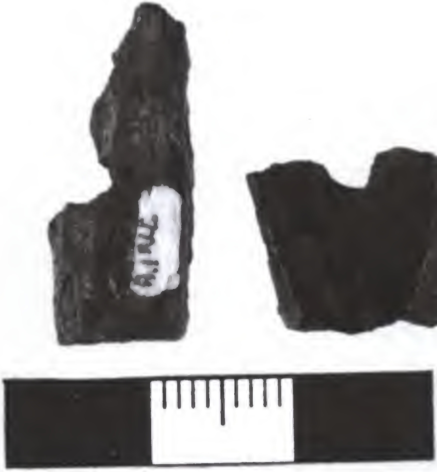

Figure 3:15 Ivory bead preforms

but were drilled by an unknown animal has been considered. These are believed to be manufacturing failures, the first recognized among the organic Paleoindian tools of Florida.

The smaller artifact (Sloth Hole Area 1) seems to be the more modified. Though broken half way across the hole the length is 1.25 cm. The seemingly complete width is 1.58 cm. This preform has a nearly uniform thickness of 0.6 cm. The cleanly drilled hole is 0.4cm in diameter.

The larger, poorly shaped artifact (from Sloth Hole, Area 1, Rock Ledge, Center) is 2.25 cm long. Two thirds of this smooth hole remain, and is 0.45 cm in diameter. Maximum width is 1.0 cm. Thickness across the broken hole is 0.7 cm. This ivory artifact tapers in thickness slightly, after the break.

Several observations seem cumulatively to warrant inclusion of these artifacts. First, they are generally similar to Upper Paleolithic ivory bead preforms from Le Grotte de Spy so their overall morphology is close to other known specimens (Knecht et al. 1993). Secondly, over 6,000 fragments of ivory from Sloth Hole these bead performs were the only drilled or bored objects identified (Hemmings 2000). This form of ivory modification does not occur naturally, or frequently. Finally, Sloth Hole was clearly a manufacturing site of ivory tools, most prominently of the ~30 cm curved point. Six types of ivory tools have been found at this site. Large quantities of ivory shavings or debitage have been identified and the discovery of unfinished artifacts fits well within the collected assemblage.

Proboscidean ivory barb

Ben Waller found this item in the Sante Fe River, Gilchrist County, (FLMNH VP# 123768). It has a rounded, scored hafting area and is slightly teardrop shaped as it tapers to the elevated point The manufacture by grinding and overall form is duplicated in several bone specimens of unknown age. Until it is dated directly or another example is found, it is included on a tentative basis.

Proboscidean ivory needle

The tip of a slender ivory needle was found in the surface assemblage of Sloth Hole, Aucilla River, Jefferson County (Figure 3:16). Total length of this tool fragment is 2.61 cm. The maximum diameter is 0.48 cm at the proximal break end. The tip was pitted and chipped after being resharpened. It appears that some use polish may survive on the tip. This needle tip is considerably smaller than the tip of the ivory awl discussed next. Lacking the proximal tool end it is impossible to discern the actual shape of this needle. Six eyed bone tools have been found in Sloth Hole but all are of unidentifiable bone. It is expected that this was indeed an eyed needle but this supposition must remain unconfirmed until more, are located.

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Proboscidean ivory awl

The Simpson family of High Springs, Florida found the first of three ivory tools in the Ichetucknee River in 1927 which were later described by Albert Jenks and Mrs. Homer Simpson (1941: plate XXIV:b; shown in Figure 3:17). At the time there was

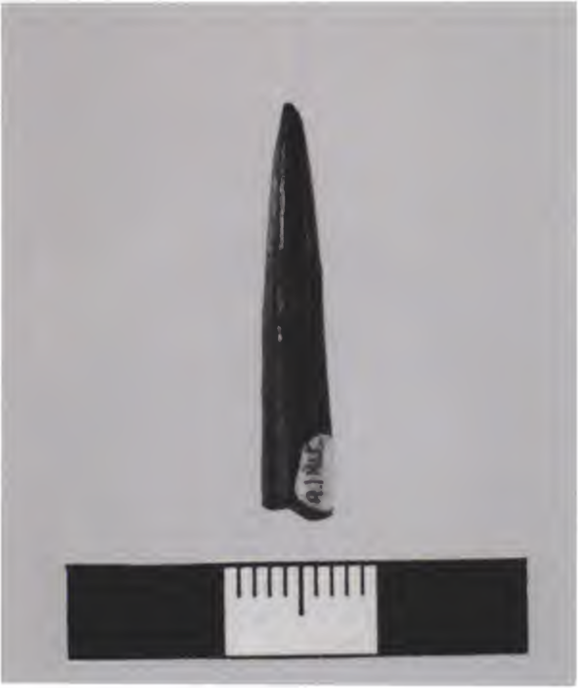

Figure 3:16 Ivory needle tip

doubt in the authors mind as to the composition of the three artifacts. All three are ivory. One is a unique form 9.1 cm long (Figure 3:17 smallest item). The maximum diameter of 0.83 cm is just distal to the beveled hafting area. By way of comparison with the needle tip at 2.61 cm from the awl tip the diameter is 0.7 cm or nearly a third greater. The hafting area extends for 2.0 cm from the proximal end. This short, straight-pointed artifact is believed to be an awl because of the distinct polish on the distal tip. Several short, straight ivory points have been found that are somewhat larger but none are so finely made as this one.

Proboscidean ivory square cross-section, bi-beveled rod

Yet another unique Floridian ivory tool form from the Ichetucknee River, Suwannee County, is a bi-beveled rod, square in cross section. This portion of the tool is 14 cm long. Longitudinal splinters run towards the middle from each end such that only 2.2 cm of the shaft are complete in cross section (Figure 3:18a). The maximum dimensions along this section are 0.79 cm by 1.03 cm. Traces of haft scoring are visible at each preserved end. Because of the diminutive form and fragmentary specimen no functional interpretation is proposed beyond saying that this was likely part of a compound tool rather than a solitary implement. The description may superficially sound like the bone rods from East Wenatchee. This tool is substantially smaller and much more intentionally squared in cross section. On a much reduced scale it might have served the same functional purpose. The breakage all appears to be later brittle damage.

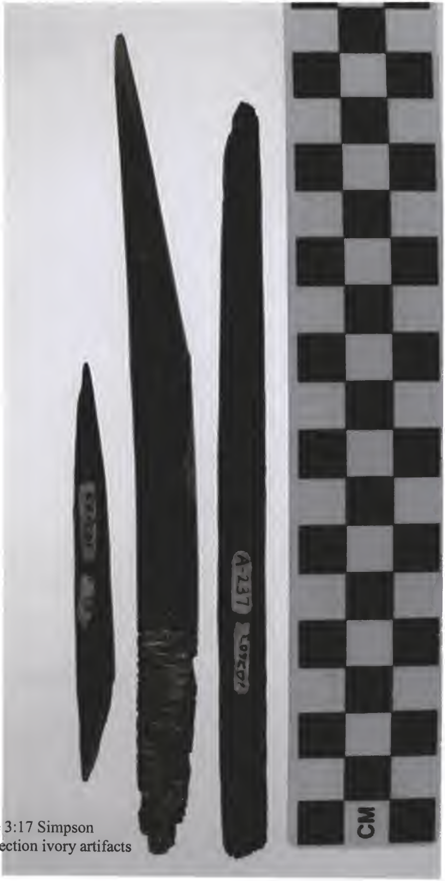

Figure 3:17 Simpson Collection ivory artifacts

Proboscidean ivory oval cross-section shaft

In the West Run of the Aucilla River Todd Bevis recovered a pair of mending fragments of an oval cross-sectioned, straight ivory rod. It is likely this was a point but as both ends are missing it is impossible to surmise how long it was and what the business ends looked like. The surviving midsection is 14 cm long. This artifact is orientable as the oval tapers slightly through its length. Proximal dimensions are 1.33 cm by 1.07 cm. At the distal break it has shrunk to 1.22 cm by 0.91 cm. Both broken ends are jagged green tusk breaks (see Figure 3:18b). This fragment of the tool is straight and because the taper is discernable it seems unlikely there was any curve when complete. This point was likely 20 to 22 cm long when intact. Because of the oval cross section and overall large diameter this was probably one of the more robust ivory weapons yet found.

Proboscidean ivory straight, barbed point

Clear evidence that some ivory tool forms were launched projectiles was discovered in the Aucilla River at The Glory Hole by Todd Bevis. The barbed ivory point is split longitudinally and a mending ivory shaft sliver was also recovered (Figure 3:19 bottom). There can be no doubt this artifact is a point. When mended the piece is 24.48 cm long. The mend overlaps for 1.1 cm. The shaft sliver is also broken through the beveled haft area approximately 2.0 cm from the original length. The haft break is a jagged green tusk break, the other fractures are later brittle breaks along internal ivory fracture planes. There is an unconfirmed report of a second barbed ivory artifact in Florida that is complete. This is the longest known straight ivory artifact in Florida.

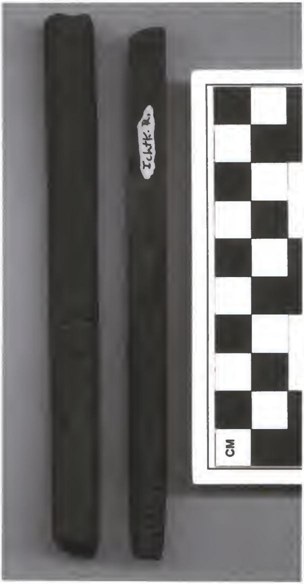

Figure 3:18a-Ivory rod square in cross section; 18b-Ivory rod oval in cross section

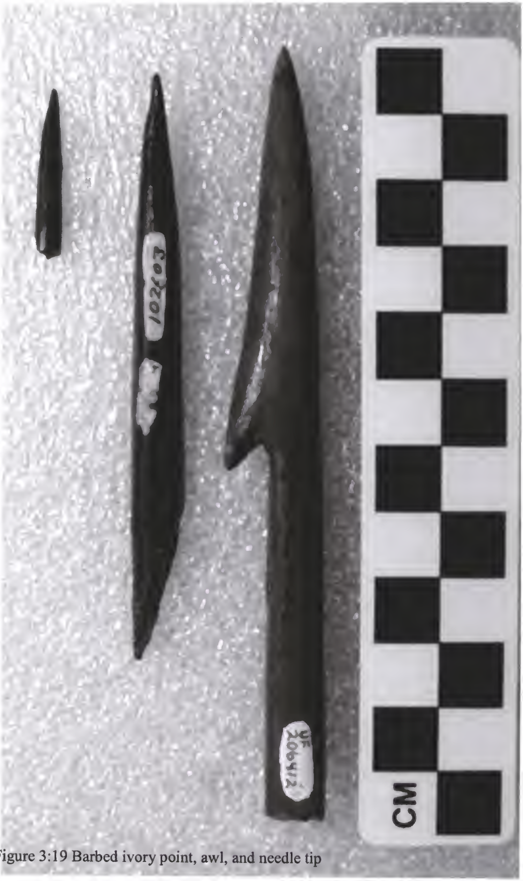

Figure 3:19 Barbed ivory point, awl, and needle tip

Proboscidean ivory straight, launched points (12-24.9 cm)

The straight ivory points in this section are thought to have been launched rather than thrust as will be discussed in Chapter 4. Three complete or nearly complete examples are know from Florida (Figure 3:20). Additional specimens of this form from Texas, Montana, and Alaska are discussed in the next section. The ivory awl is noticeably more slender and shorter than the points in this category.

The length criteria uses the shortest, stout examples known for the low length limit. The longest straight ivory points across North America are all less than 25 cm which serves as a convenient upper limit because there is no overlap with the curved ivory points from Florida (all of which are at least 25 cm long). On all examples from Florida the greatest diameter is immediately distal to the beveled hafting area. From that location they taper gently to a moderately sharp point.

The smallest, most gracile complete example is from Sloth Hole in the Aucilla River, and was donated as part of the Ohmes Collection (FLMNH VP #136493). It is 13.7 cm long and its maximum diameter is 0.485 cm. The mid length point is 17.4 cm long and the maximum diameter is 1.44 cm. The middle example has brittle longitudinal breaks on the tip and through the beveled hafting area but is sufficiently complete to insure the measurements are accurate. The final example has a typical, jagged, green tusk break in the haft element. Length with the break is 15.57 cm long and would have been nearly 19 cm when complete. The maximum diameter is 1.34 cm. All three are circular in cross section and are reasonably symmetric throughout their length.

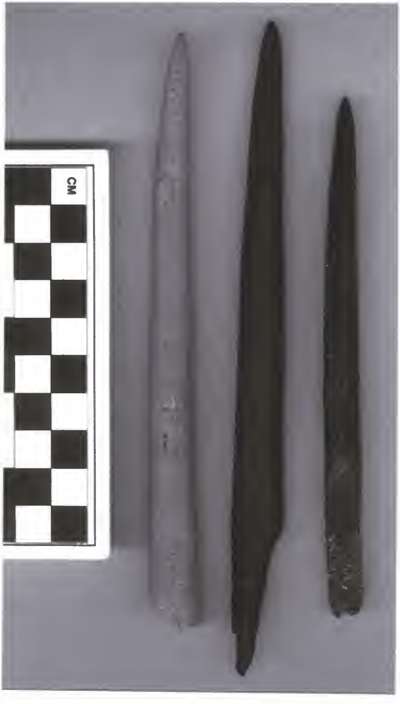

Figure 3:20 Straight ivory points 12-24.9 cm

Proboscidean ivory curved, hand held points (25-40cm)

The ivory shaft tool commonly, and erroneously, referred to as a "foreshaft" (Haynes 1982; Lahren and Bonnichsen 1974; Wilke et al. 1991) is far and away the most common formal bone or ivory tool found in North America made from an identifiable element of an extinct taxa. Currently 113 have been observed or examined by members of the Aucilla River Prehistory Project over the last 35 years. Only a handful are complete and the 31.5 cm Ohmes ivory point with a zigzag design on each side is considered the type specimen (FLMNH VP#136494). This specimen has been illustrated in several locations and is probably the most widely recognized Paleoindian ivory tool from Florida (Haynes 1982; Webb and Hemmings 2001:7).

Typically these ivory points are approximately 30 cm long with a gentle curve throughout their length. The broadest diameter is immediately distal to the beveled hafting area. The cross section diameter ranges from ~1.0 cm to 1.5 cm at the broadest point. The diameter of the shaft tapers along the shaft length to the point tip (see Hemmings 1999 especially for complete description).

Several minor variations or artistic modifications are briefly noted. The type specimen has a zigzag design on each lateral face just above the haft element on the main shaft. The design is repeated 28 times (up and down cycles) and could possibly represent a lunar cycle. A fragmentary shaft section, also from the Aucilla River (UF#123723), with a jagged green haft break has nine "tally marks" carved on its lateral faces (4 and 5 on each side). It is interesting to note that both artistic designs are places above the beveled haft and the area that would have been covered by sinew. The designs were placed so that they would be visible when the weapon was functional.

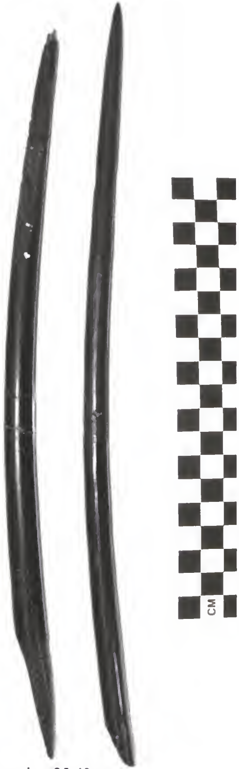

Figure 3:21 Curved ivory points 25-40 cm

An exceptionally long slender point was reconstructed from six pieces recovered at Sloth Hole, Aucilla River. This is the longest tool reported in North America (UF #206412). The shaft has a non-brittle break above the haft element but appears that it would have been almost exactly 40 cm when complete. Law enforcement officials have indicated a second, complete, specimen has been removed from a site in the Aucilla drainage but this report is unconfirmed.

The curvature of the shaft is, without exception, in the same plane as the beveled haft element. That is to say, the beveled haft is always on the outside of the curve. The Schreger band pattern is orientable in even minute fragments of ivory and without exception the tip is distal and the beveled haft is proximal within the original tusk. Clovis ivory tool manufactures had an incredibly detailed knowledge of tusk anatomy as well as the performance characteristics of ivory. By making the weakest point (the area immediately above the haft) the thickest they attempted to mitigate the damage occurring at the point of greatest stress. That the typical haft break occurs within a centimeter proximally of the haft end indicates that the large diameter shaft barrel was in fact effective at breakage prevention.

Combined North American Early Paleoindian Formal Tool Summary and Discussion

Each of the 239 formal bone and ivory tools from Early Paleoindian sites across North America have been mentioned, and most fully described. Table 3:3 lists all of these tools and tentatively assigns functional categories. At a minimum this is intended to aid in distinguishing the multiple forms from one another even when the functional

Table 3:3 Formal Clovis osseous tools by type

Tool Form	**Frequency**	**States**
Abrader: *Mammut americanum* radius (Page/Ladson)	1	FL
Anvil: *Mammut americanum* patella (Butler Site 8Su2)	1	FL
Art- Adornment: *Canis dirus* mandible (Aucilla Powerline)	2=1 jaw	FL
Art- Adornment: Bone pendant (Mill Iron/Goshen)	1	MT
Art- Adornment: Bone probo disk- (Butler Site 8SU2)	1	FL
Art- Drawing: *O.v.* humerus w/mastodon picture (Jacob's)	1	MO
Art- Drawing: 7 tally(?) marks on Point I1 (XXX)	1*	FL
Art- Drawing: Zigzag design: Point I1 (Sloth Hole)+Jacob's	2*	FL and MO
Art- Drawing: Zipper design on Bone Rods (E.Wenatchee)	2*	WA
Art- Sculpture: *Palaeolama* sacrum coyote (Tequixquiac)	1	MEX
Atlatl Hook: Ivory point fragment reworked (Santa Fe R.)	1	FL
Atlatl Hook: *Mammut a.* vestigial tusk (Ich Bison Landing)	1	FL
Atlatl Hook: *Palaeolama* proximal phalanx (Hendrix Col.)	1	FL
Awl: Bone no id. And *Equus* 5th metatarsals	1, 1+, 1+?	NM, NV
Awl: Ivory 8cm, single bevel, tip polished (Ich Simpson C.)	1	FL
Bannerstone, mammalian cancelleous bone(Ich Simpson C.)	1	FL
Barb: Ivory 4cm, beveled to stick up (Sloth Hole)	1	FL
Bead- Bone (Broken Mam, BWD, Etna Cave)	1, 1, 1	AK, NM, NV
Bead or Bead Preform- Ivory (Sloth Hole)	2	FL
Beamers: *Mammuthus* spineous process (Hillsborough R.)	2	FL
Billet: Ivory tusk section (BWD, Trull)	2	NM, TN
Dagger: *Equus* and *Palaeolama* metatarsal Mandalay Stein	3, 1	FL
Debitage-Core: Ivory discards (Semi-fab.)(Hendrix, BWD)	1, 1	FL, NM
Drilled Bone: adornment perform? (Potter Creek Cave)	4	CA
Flute: *Odocoileus virginianus* metacarpal (date?)(Hendrix)	1	FL
Graver: *Mammut americanum* molar fragment (Hendrix)	1	FL
Handle- Bone: *Equus* l. tibia socketed, (Wac.#9, Navarette)	1, 1	FL, AZ
Handle- Ivory: ground fragment (Sloth Hole)	1	FL
Mattock/Hoe: proboscidean rib; ? (Withlacoochie, Sask)	1,1	FL, SASK
Needle: Ivory tip (Sloth Hole)	1	FL
Point- Bone 1: 25-40 cm	None	
Point- Bone 2 launched: 12-24.9 cm all straight	9	ak,az,nm.oh,tx,wa
Point- Ivory 1 hand held: 25-40cm all curved	113	FL
Point- Ivory 2 launched: 12-24.9 cm all straight	3+, 1, 1, 2	FL, MT,TX,AK
Point- Ivory 3 launched: barbed: 25cm straight (Glory Hole)	1	FL
Rod- Bone: generically reported	35	ca,nv,nm.nd,wy
Rod- Bone: single beveled end	1- point?	Anzick, MT
Rod- Bone: both ends beveled	6, 14	MT, WA
Rod- Ivory: generically reported	1	CO, Drake
Rod- Ivory: both ends beveled, square cross sect.	1	FL, Ichetucknee
Rod- Ivory: Oval cross section, straight 14cm section-point?	1	FL, Totem Shoal
Shim: Ivory (China Lake Cave)	1?	CA
Toggle: Ivory (Broken Mammoth)	1	AK
Unknown form or modifications: probo fibula (Lac du Bon)	1	MAN
Wrench: proboscidean bone (Murray Springs)	1	AZ
Totals:	* + as other cat	
44 distinct forms recognized	N=239	15 states 2c 1m

interpretation is weak or expected to be revised. Forty-five distinct tool forms are currently recognized, indicating a far more diverse toolkit and artistic tradition than Early Paleoindians are ever credited with having created.

While there are as yet only eight entries considered to be artistic in nature it is clear by both geographic distribution (Washington, Missouri, Montana, Florida and Mexico) and utilized taxa (*Canis*, *Palaeolama*, *Odocoileus*, and multiple proboscideans) that repeated use of similar manufacturing processes transcend the specific medium the artisan worked in. It is argued that despite the small sample (n=9) there is patterned expressionistic behavior among Early Paleoindians.

The most important newly recognized artifact type in the Clovis toolkit is the atlatl hook. Three specimens manufactured from identifiable elements of extinct Pleistocene fauna provide compelling evidence that Clovis people launched spears as part of their hunting adaptation. It is now clear that Clovis people were well equipped to dispatch any sized game from a reasonable distance.

Ten forms of points and rods are recognized at present. The needle tip and ivory awl round out the assemblage of a dozen pointed or beveled hafted shaft tools manufactured to accomplish an indeterminate array of tasks. Bulk generic reporting of Clovis bone rods or tools has clearly masked variation in both form and function (Lahren and Bonnichsen 1974).

The group of projectile forms was designed as part of an internally consistent weapon system. Essentially they were designed for a broad range of specific tasks but not for every task. Using a socketed foreshaft idea derived from Eskimo examples, Dennis Stanford suggests a possible antler tanged socket from Indiana may be similar to what Clovis people were using in conjunction with the bi-beveled Anzick bone rods (Stanford 1996:45). No manufacture evidence is discussed and it is important to distinguish rodent gnawing and natural deterioration of the softer internal, porous area of the antler from cut, drill, and grinding activities by humans. The enlarged diameter of the piercing end of a socketed foreshaft spear greatly reduces its penetrating ability. Differences in hunting of terrestrial and aquatic mammals further demonstrate the reduced utility of the complicated foreshaft system. Namely, close quarter toggled spears do not need to be particularly aerodynamic for their short flights. Curved "foreshafts" and asymmetric toggles will not fly in predictable trajectories and are therefore unsuitable for terrestrial mammal hunting engaged in by Clovis people. Maritime Archaic toggled weaponry designed for sea mammals and lanceolate projectiles for caribou are not exactly interchangeable yet are technologically variable parts of one cultural system (Cotter 1938).

Formal bone and ivory tools can and were easily made for specific needs. Finished artifact morphology exhibits a reasonably high degree of typological patterning. Even greater cultural continuity is exhibited in the manufacturing process utilized to create these tools.

This suite of artifacts includes cores and debitage from the manufacture of other tools, the bone wrench (and possibly other forms) utilized in the direct manufacture of other tools, elements of composite tools (atlatl hooks, handles, rods, etc.), numerous point tips for hunting or possibly personal defense, and several objects of clearly artistic import. While even a sample this large is only a glimpse of how pervasive organic technology was within the Clovis cultural system this view greatly expands our understanding of many aspects of the Clovis technological adaptation and overall culture.

Taxonomic Utilization for Formal Early Paleoindian Osseous Tools

Currently six individual extinct species have been identified as the source of formal bone and ivory tools across North America. Table 3:4 lists the preferred tool stock taxa with data on element selected, morphological tool form, and frequency of tools known at present.

Table 3:4 Taxa utilized as formal bone tools

Animal	**Element**	**Tool Form**	**Number***
Canis sp. *dirus?*	Mandible	Ornament	2-1 ind.
Palaeolama mirifirica	Sacrum	Art-coyote skull	1 Mexico
	Metatarsal	Dagger?	1
	Proximal phalanx	Atlatl hook	1
Odocoileus virginianus	Humerus	Art-M.c.	1 MO
	Metacarpal	Flute	1
Equus sp.	5th metatarsal	Awl	3+? NV,NM
	Metatarsal	Dagger?	3
	Tibia	Socketed handle	1
Proboscidean- sp.	Tusk	16 forms	135 total
	Fibula	Unknown	1 Man
	Rib	Mattock/hoe	2 Fl, Sask
	Bone	Rod- just listed	35 in 5 states
	Bone	Rod- single bevel	1 Anzick MT
	Bone	Rod- bi-beveled	20 MT, WA
	Bone	Point 12-24.9cm	9 in 6 states
	Bone	Other forms	2 FL, AZ
Mammut americanum	Vestigial tusk	Atlatl hook	1
	Molar	Graver spur	1
	Patella	Anvil	1
	Radius	Abrader?	1
Mammuthus sp.	Spineous process	Beamer	2
Unknown mammal	Unknown	5 forms	10 in 5 states
Six known species	14 elements id'ed	44 forms total	239 total

N.B. if no state is listed the sites are in Florida.

These tools are almost exclusively manufactured from low meat utility elements. Tusks, teeth, mandibles, the patella, fibula, tibia, and even a humerus have little value for the meat around them. The ribs and spineous processes are from richer meat yielding areas but there is clear selection for low meat utility elements. It is suggested this is direct evidence of hunting rather than scavenging of animals. Meat is not wasted to procure tool stock. The elements preferentially selected for tool stock, particularly metatarsals and tusks, do not conflict with meat procurement from the same animals.

Considerable numbers of deer metacarpal and metatarsal tools will eventually be added to this list. Significant similarities in manufacture occur on some deer bone tools. Occasionally scored hafting elements of deer bone tools are recovered. Direct dating of some of these will certainly indicate a portion of them are Clovis age. Sloth Hole likely will lead the way in this research as more than 1000 deer bone tools in 75 forms have been found in this one Aucilla River site. If only 5% are Clovis that is still 50 individual tools.

Formal Bone Tool Manufacturing Processes

Bone and ivory source material have specific characteristics that will influence performance of the finished tools. Morphological selections and changes in those selections reflect material property limitations, task differentiation, and style among other variables, some of which may be at odds with one another (i.e. an aesthetically pleasing tool may be functionally useless). Some patterns, and changes in patterns, of manufacture appear to be time transgressive, particularly in Florida. Because of the large sample size the repeated use of the beveled haft and patterning in the scoring seem to occur on very few Holocene taxa.

The Floridian ivory tools dominate the sample in this chapter and have limited visibility within the archaeological literature. Specific material properties of proboscidean ivory and how they might influence tool morphology and performance characteristics are briefly considered. Ivory is an anisotrophic medium (i.e. ivory has mechanical properties that differ in different directions within the material) (Johnson 1989). The cross-hatched Schreger band pattern and cone in cone layers of dentin within even minute pieces of ivory are anatomically orientable proximally and distally (Fisher et al. 1998). Eight ivory point fragments have been sectioned for proboscidean species identification and anatomical orientation examination. All eight are mastodon tusk ivory, oriented such that the point is distal within the tusk and the beveled hafting end is proximal within the tusk. The consistent orientation of the anatomically important anisotrophic ivory is the most compelling evidence available to indicate that the 25 to 40 cm long curved ivory points are indeed points and *not* foreshafts. The pointed tip of the tusk, and the tool, is better suited to absorb impact than the beveled hafting end and this information was clearly known to Clovis people in Florida.

Time-transgressive manufacturing changes noted above may delineate culturally diagnostic tools based on how they were created. This is seen in bone tool haft elements: the shift from ivory to deer metapodials in Florida is most likely to be culturally diagnostic because the medium changes from numerous forms to a single extant form in the Holocene at the same time the hafting form changes. There are a limited number of deer bone tools with scored, cross-hatched beveled hafting areas nearly identical to the typical ivory tool haft element. Because the deer are not exclusively part of the Pleistocene fauna they need to be directly dated to see if this hypothesis holds true.

The manufacture of bone and ivory tools by grinding has been mentioned for several specific tools in this chapter. Nearly every bone and ivory tool in this sample was created or finished by grinding. Even clearly cut artifacts like the *Canis* mandible ornaments and the barbed ivory point have extensive grinding to form and finish the tool. Tools other than point shafts and rods are also largely formed by grinding, something that has received minimal comment in the literature (see Hester 1972).

The reductive manufacturing process from tusk to ivory implement is becoming fairly well understood. Known intermediate steps now include: tusks cut free of the skull (such as the Page-Ladson specimen); the pecked and girdled tusk semi-fabricate from Blackwater Draw (Saunders et al. 1991); the tusk core debitage cone from the Hendrix Collection of the FLMNH; several thousand ivory shavings from a workstation area of Sloth Hole (Hemmings 2000); nearly 150 complete and fragmentary ivory tools from Florida, several of which have been resharpened; and even one curated, reworked ivory shaft fragment made into an atlatl hook..

Clovis ivory tool manufacture essentially mirrors lithic reduction processes and tool life cycles. The sectioning and splitting of tusks is directly analogous to the creation of large bifacial cores, such as the Anzick examples, that are split to create easily worked blanks or performs. The reductive template utilized by Clovis people in stone and ivory tool manufacture is remarkably similar across the continent regardless of the media.

It should be noted that no performs or roughed blanks of ivory are currently known but their existence is certainly expected based on the manufacturing trajectory outlined from the known steps.

CHAPTER 4
CLOVIS SUBSISTENCE

Subsistence Introduction and Definition

Aspects of more familiar Clovis topics are now presented to integrate the dietary and osseous tool data into a larger more meaningful framework. Patterns in lithic technology and resource exploitation strategies demonstrate that Clovis points are not the only aspect of their culture that occurs across North America. Sections on Clovis lithic technology, the conspicuous lack of Post-Clovis extinct faunal associations, and gathered plant and animal resources will structure discussion of the specialized technological adaptation that facilitated the generalist foraging adaptation. The overarching framework is argued here to be represented by a widespread, internally consistent cultural adaptation: Clovis.

By first synthesizing several aspects of the Clovis lithic technology regarding stone points, fluted point manufacture and failure, bifacial core and polyhedral blade core technology, are highlighted in conjunction with formal bone and ivory tools already described. Clovis material culture becomes the backdrop against which the fully articulated evidence for Clovis generalist foraging behavior can be superimposed (the recovered dietary remains). Finally, examination of gathered resource exploitation during subsistence activities allows for additional comments regarding patterned behavior within the Clovis adaptation.Subsistence as used here specifically means the utilized dietary resources and the specific technological adaptation used to procure that diet (sensu Dennell 1979). Simply put, subsistence consists of utilized commodities and the facilities used to procure them (Dennell 1979:122). Our perception of the Clovis subsistence strategy is largely limited to saying they made high quality stone and osseous tools to hunt. That, alas, is what the archaeological record has preserved. Gathered plant and animal remains indicate that the strategy was more complicated than just preparing to hunt and then hunting. Additional aspects of Clovis culture not exclusively related to subsistence presented in the next chapter indicate the situation is much more complex and that in fact we are able to discuss it intelligently. However, we are unable to discern what additional aspects of the technological adaptation were required to add these items to the Clovis diet: we do not know what we are missing. These items could include such things as grinding surfaces (whether portable or not) and other unidentified processing equipment.

Clovis Lithic Technology

Limited aspects of Clovis lithic technology selected to demonstrate behavior patterning are presented which indicate consistent use of strategies across the area in which we find Clovis points. Diagnostic Clovis points are one overemphasized aspect of a consistent cultural adaptation. Additional stone tool characteristics consistently observed as part of the Clovis technological adaptation are generally better know and understood than the organic tools because of larger sample sizes, almost entirely due to preservational biases inherent in the recoverable archaeological record (Collins 1999, Meltzer 1993a).

The limited sample size of known Clovis ultrathin bifaces exemplifies the problem of the absence of evidence adversely influencing perception. An ultrathin biface typically has a width to thickness ratio greater than 10:1 (Collins 1999). Clovis ultrathins have been recovered at Gault, Pavo Real and Wilson-Leonard in Texas (Collins et al. 1998; Collins et al. 2003). Though typically associated with Folsom assemblages it is important to recognize they first appear at Clovis sites (Jodry 1998; Surovell et al. 2003). As such they are another demonstration of cultural/technological continuity among Early and Middle Paleoindian archaeological cultures. This time-transgressive technological continuity is elaborated below regarding these artifacts.

Bifacial Core Reduction and Points

A peculiar strategy employed in the manufacture of larger Clovis points has been observed at several sites in the Western United States. The caches at Anzick and Busse include oversized bifaces intentionally notched to split them into slivers for point manufacture. Wilke et al. (1991) used the term sectioning to describe this method of reduction. Sectioned fragments of larger bifaces leave edges with easily prepared platforms along the sides of the preforms. This reduction strategy makes it exceptionally easy to finish large Clovis points from ready-made preforms. A useful aid to lithic analysts is that frequently a relict platform perpendicular to the face of the biface will be left behind that readily identifies a point has having been produced from a large bifacial core. Examples of these remnant platforms are observed on several Anzick and Fenn points (Fenn point #110, 118, 122, and 124 in Frison and Bradley 1999). This specific breakage and section biface reduction has recently been reported from a Folsom ultrathin biface refit with a broken point preform at Locality B of the Barger Gulch Site, Colorado (Surovell et al. 2003:75). This splitting and sectioning is remarkably similar to the strategy employed to manufacture ivory tools from proboscidean tusks outlined in the previous chapter.

Another important example is a "pie shaped" fragment of a very large radially fractured biface recovered at the Lime Ridge Clovis site in Utah (Davis and Brown 1985:2). This discovery is particularly important as this is a habitation site and not a cache like Anzick and Fenn. Possibly this indicates sectioning of large bifaces was a regularly utilized technique for point manufacture. The intentional breakage of bifaces to facilitate point manufacture is likely to be more common than currently known or reported. Although the observed geographic range is somewhat restricted at present, the sample is growing.

Similar reduction of large thin bifaces is reported from Ready/Lincoln Hills and refitted flakes from Sheaman (Bradley 1982:154; Morrow and Morrow 1993:60). Two Sheaman site artifacts exhibit important intermediate stages in the trajectory from large bifaces to finished Clovis points: the 13 by 7 cm bifacial core fragment and 12 by 6 cm refitted overshot bifacial reduction flake biface are entirely consistent with similar unused specimens from the Anzick and Fenn caches (Bradley 1982:148, 154; Frison and Bradley 1999:#'s 107, 113,128,135 for the biface and 127, 117, 118 for the refitted flakes).

A note on material used for making some of these larger points and the deeply concave based points like those from Colby is worth mentioning. Red jasper from the

Big Horn Mountains, Wyoming was used for two or three of the Colby points, two of the Fenn Cache points (the Colby like point and the ribbon flaked Clovis point), and one point in the Simon Cache (Frison and Bradley 1999:79). Further, the Fenn Cache has a total of three points like the Colby bases, one of these is the same red jasper from the Big Horn Mountains, WY mentioned above (Frison and Bradley 1999). Not only is there exceptional repetition of exotic material use, but the particular Colby point form is shown to have been made elsewhere as well.

The widespread creation of tools on bifacial core flake removals is beginning to be appreciated as outré passé flake tools are recognized in numerous Clovis assemblages (Collins 1999; Haynes 2003; Kelly 1988; Meltzer 1993a and c). The bifacial cores can function as cutting implements on their own. Outré passé or overshot flakes removed from bifacial cores are frequently unifacially flaked and used as tools. As the bifacial cores are exhausted they can be further reduced from performs to points. This process varies slightly from that outlined above in that these smaller bifacial cores/performs are not splintered and sectioned but are rather reduced in the typical planing and thinning technique. Bifacial core reduction and tools manufactured from outré passé flakes have been found in quantity at some Clovis sites in Florida. The ivory workstation in Sloth Hole contained 12 exhausted overshot flake tools (Hemmings 2000).

Variation in Clovis point forms is elaborated in Old and New Clovis in the next chapter. Some comments presaging that discussion should be introduced with discussion of other Clovis point topics. There appears to be at least two co-traditions within Clovis point reduction trajectories and morphological types. Parallel sided and excurvate sided Clovis points overlap along a fairly southern latitude from Arizona to Florida. The excurvate sided Clovis points typically have a single and a multiple flute face. This combination seems most common at the moment. Intentional removal of an outré passé flake at the widest point, above the waist, after the largest single flute is removed makes the thinnest spot above or at the widest point. This means the widest point and the thinnest point are the same. This creates a very wide, razor like wound profile upon penetration by this point (Doran and Hemmings 2004). This specific set of morphological and reduction criteria has been observed on Clovis points in Arizona at Murray Springs and Punkin Center (Huckell 1991); in New Mexico at Blackwater Draw, #34 Denver MNH cast series (Hester 1972); and Texas with several at McFaddin Beach, Gault, and the single point from Lewisville (Collins et al 1991; Crook and Harris 1958; Long 1977). Additional examples are currently known from Louisiana, Florida, South Carolina, Ohio, and New York.

The parallel sided and excurvate sided points have faces that are V shaped from the base up. The second tradition has essentially parallel faces (like a Folsom) and parallel sides. Gainey points are essentially what is described by this set of characteristics. The northern tier tradition idea is currently under construction as more point examples can be examined (Hemmings 2004). The parallel sided, parallel faced points seem to range west to east along areas where Goshen and Gainey points are found. Currently, technological seriation only using suites of characters is attempted. It is suspected that chronological seriation will indicate Goshen and Gainey overlap and survive Clovis in areas where they co-occur (Tankersley 2002).

The differentiation of Clovis points, particularly if time-transgressive forms become diagnostic within Clovis, may be our first indication of a cultural response to the end of the Pleistocene and the faunal extinction event (s).

Clovis Blades, Blade Tools, and Blade Cores

Pavo Real, TX contained the first recognized blade core tablet flake (Collins et al. 2003; Stanford 1991). Core tablet flakes, or blade core rejuvenation flakes, have also been recovered near Anadarko in the Wichita Cache, OK (Ballenger 1996:53); the Evant, TX blade core group (Goode and Mallouf 1991:67); and Aubrey, TX (Ferring 1990:10).

Clovis blades and tools on blades are now seen as culturally diagnostic in much the same manner as fluted Clovis points (Collins 1999). It is becoming clear that production of true blades (*sensu* Bordes 1969), on cylindrical and wedge-shaped polyhedral cores by Clovis people, was a widespread patterned strategy as much as the production of fluted points and ivory or bone tools. Known occurrences of blades, tools on blades and blade cores are compiled in Table 4:1.

The occurrence of Clovis blade technology is clearly continent wide when the assembled data are examined. Clovis blades have been found in 20 states plus Ontario, blanketing the continent. Clovis blade technology is not a southern or plains phenomenon as can be seen on Figure 4:1. Clovis Blade technology is simply another consistent portion of the specific specialized technological adaptation utilized by Early Paleoindians in North America.

Table 4:1 Clovis blade and blade core localities

Site	State	Number	Comments
Adams (15CH90)	KY*	40, maybe	St. Genevieve C4, 1 Dover 4 Cores+ bl tools
Anadarko: McKee	OK*	22 or 24	Cache site Edwards & Alibates 11 broken
Arc A037-10-0009	NY*	2 bl tools	Crp12:9
Aubrey	TX	1	
Big Eddy Site 23CE426	MO	1	Only 1 blade tool fragment, C4 fragmentary
Blackwater Draw	NM	17	Cache Green, all Edwards
Blackwater Draw	NM	5	Cache #2 Alibates? Crp9:32
Bostrom	IL*	4 ?	31C,G,Holc all non-local /exotic crp8:49
Boyd (15CH236)=Ledford	KY*	1+core	Local Hopkinsville chert, crp8:43 2 date wait
Bull Brook	MA	#?	Blades and blade tools
Busse Cache	KS*	25+cores	25 Blades, blade tools. +Core(s?) 90 items 7.3kg+
Carson-Conn-Short 40BN190	TN*	35 b/bt	35 bl/blt, 11 Cores, C27+ 43 hearths, 3 Cl. Strata
Cedar Creek	OK*	7	SW OK cache site? Really Clovis?
Coates-Hines 40WM31	TN	1	Prismatic blade fragment crp13:6
Comanche Hill (Van Autry)	TX*	2 cores	Central TX cache site? 2 Cores only? Edwards
Crockett Gardens 41WM419	TX*	5	C. TX cache site? 3-Strat6 BHtr6 2 surf Alibates?
Domebo	OK	1	Surface find in adjacent stream
East Wenatchee	WA	6, 3 site	6 in Cache, blades or tools on blades (MC99#5)
Eisenhauer (41BX959)	TX*		Central TX cache site? Core
Eudora	ONT*	100's/80	
Evant (Hamilton Co.)	TX*	3 cores	Local Edwards, 2 var. polyhedral, small cache
Ezell (15Ch483)	KY*		Local Hopkinsville crp8:43 date wait
Fenn Cache	WY/ID*	1	Green River Chert, utilized flake
Florida Purdy 1981	FL*	4	Purdy 81:13 4 examples but no site
Fossil Hole Quarry	FL	2	Rather thin compared to others
Garland Cache	OK	?	Duncan SAA1994 Clovis Blade Cache Edwards
Gault (41BL323)	TX	13/36 frg	1 Tool on blade frag. 13 blade cores (1 surf)
Greenbelt, San Antonio	TX*	1bl 1core	14.3cm long blade core crp14:104
Hendrix Collection Santa Fe+	FL	4+?	4 +more boxed, Sante Fe river above Highway 27
Horn Rockshelter #2	TX	2	1 Complete, Edwards
Keven Davis Cach. 41NV659	TX*	14	11 Georgetown Edwards 205km ? 3b?, 4 frags.
Kincaid Shelter	TX	1 core	Blade core only, well used up
Klostermeier 11JY241	IL*	5+	Blade tools C3 1comp=Fern Glen all 5km
Lehner	AZ	2	
Little Pin Oak Creek 41FY53	TX*	# + 1 core	# of prismatic blades, poly core, 1 Clovis
Lubbock Lake	TX	2	Johnson 1987:110 lists TTU-A4433/A5150
Martens (23SL222)	MO*	#+2 cores	C16 Cpref10 +many bl- bl tools, 5 cherts
McFaddin Beach	TX	11	3 complete blades+ blade tools and fragments
Morrow-Morrow	IA*		
Murray Springs	AZ	13+1 core	1 burned core, blades, blade tools, fragments
Parrish Village Site #HK45	KY	N=?	Blades Bl tools Freeman et al. 96. 8 Clovis
Pavo Real	TX*	25b+12bt	Blades, core tablet, blade cores, endscraper/bl
Pelland 21KC24	MN*	8+3 surf?	Cache? Plains Anth 1971 V16 disturbed
Pickwick Lake	AL*	9 b/bt	Shown by Futato 1996:305 not discussed in text
Pottawatomie County 4 sites	KS	5 cores	All polyhedral, 4 surface sites-no pottery
Ready-Lincoln Hills 11JY46	IL*		693 artifacts 223 fluted points and performs, C20
Roeder (15CH482)	KY*		Local Hopkinsville chert
Sailor Helton (Seward Co.)	KS*	166	151 bl, 10cores 5blt Alibates agate 200km S 20kg
Sheaman (Agate Basin)	MT	1?	1 blade (Frison 1982:150f) Only site w/Ochre
Spring Lake (Terrace Loc?)	TX	1	
Wells Creek (Stewart Co.)	TN*		Blades and blade tools

Table 4:1 Continued Site	State	Number	Comments
Wichita Cache	OK*	12refit=5	Core tablet, Edwards rootbeer Anadarko 3kmE
Williamson (Dinwiddie Co.)	VI*	?, 1 core	Blades, blades tools, and 1 core PA Jasper quarry
Wilson-Leonard	TX	74b/bt	Endscraper on blade
41BX998 near San Antonio	TX*	1?	Surface core find
41GL175	TX*	1?	Core with tablet scars (Collins 1999:53:b)
41LL3	TX*	2 cores	Blade core (Collins 1990:73)
41RN107 (108? C TX)	TX*	2	Blade tool + surface blade find
41UV2	TX*	1 core	1BlCore, C1, C5 preforms-2 fluted
41Medina,Travis,Williamson,	TX*	3 cores	1 Conical polyhedral blade core each county
41 San Patricio County	TX*	1	Alibates blade fragment 930km away
Total Sites: 42+4 TX co's	20+Ont		

*indicates site discussed here and in text but not included in Appendices 1 and 2.

There are several additional sites that might contain poorly, or underreported true blades: Bull Brook, Massachusetts; Corditaipe, New York; Gainey, Michigan; Holcombe Beach, Michigan; Michaud, Maine; Plenge, New Jersey; Reagan, Vermont; Shoop, Pennsylvania; Stanford-Worley, Alabama; Thedford II, Ontario; and Wells Creek, Tennessee (Collins 1999:148). Only Wells Creek and Corditaipe of these 11 sites would be considered Clovis exactly, most are fluted point sites in the Gainey-Bull Brook style (8 of 11) (see Faught 1996;Table B.02). In these eleven cases the intentionally produced true blade evidence is modest in comparison to the majority of sites in Table 4:1. Debert has five scrapers on blades that are rather short to be considered Clovis (MacDonald 1986:97). The technological adaptation change after the extinction event seems to be reflected in both blade and point production at Gainey sites.

Clovis blade technology is not limited to symmetric polyhedral, conical blade cores. Wedge-shaped blade cores are frequently recovered as well. Ferring notes that "all aspects of the Clovis technology are more variable than is usually implied by various authors" (Ferring 2001:238). There is no single Clovis solution to a stone or osseous tool need. The technological adaptation is a system intended to allow for creative solutions that still produce recognizable forms of tools that they found serviceable for their needs.

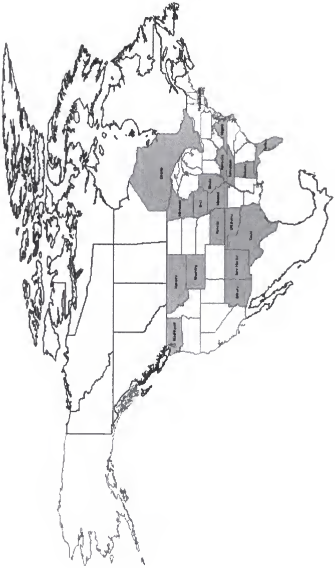

Figure 4:1 Clovis blade and blade core distribution

That is, lithic package limitations dictate how big a blade can be but not how the desired form is extracted from that rock.

Clovis Fluting and Tool Manufacture Failure Rates

There are effectively nine combinations of flute removals possible on bifaces: 0 and 1; 0 and 2; 0 and #; 1 and 1; 1and 2; 1 and #; 2 and 2; 2 and #; # and # where # is equal to or greater than three flake removals. Each face of a fluted point has a finite number of possible removal combinations: none/single; single/single; single/multiple; multiple/multiple; multiple/none. Restrictions related to thickness requirements and limitations of the stone being worked are likely to obscure or take precedence over stylistic traditions. Because of scanners and internet databases eventually all Clovis points should be sortable along these lines, or any other recorded variable.

The frequency of fluting failure is so high among Clovis points and performs that a hypothesized redundancy and technologically adaptive explanation is proffered. However, there is still a need to document assemblage level failure rates during manufacture of fluted points to see patterns or possibly trends in space or time. Because stone point manufacture failure is often thought to be greater that 50%, there has to be an adaptational response to minimize the importance of this, essentially one cannot afford to be unarmed (Ellis and Payne 1995; Haynes 2003; Knecht 1997; Tankersley 2002). Bone tools seem to fill this niche. The critical observation regarding bone tool manufacture is that bone tools rarely break while being made. Bone tools may not individually be as versatile as stone points but they are more reliable (Ellis 1997; Knecht 1997). Bone and ivory tools have almost no failure during manufacture, in part due to the use of only fresh bone. While not necessarily effective cutting weapons, they are incredibly effective at puncturing flesh (Ellis 1997). Osseous points puncturing flesh would be considerably more effective if the points were greased, this observation might explain some Clovis occurrences of red ochre outside of caches (William Hemmings personal communication 2002; Tankersley 2002). Taking Sloth Hole as a potentially typical example the frequency of stone Clovis to ivory diagnostic points is 6 to ~50 or roughly 12%. While 88% of formal diagnostic tools may overstate the reliance on organic weaponry it is clear that when there is superior preservation of organic artifacts they vastly outnumber stone tools both in raw number and formal variety (*sensu* Doran 2002).

An alternative strategy such as that outlined above would allowed for a high manufacture failure rate to be tolerated. A three-pronged projectile point strategy accounts for observed morphological characteristics and breakage patterns (direct function evidence) of stone and osseous points. Clovis projectile technology seems to have three foci: thrown stone Clovis points, thrown osseous points, thrust osseous points. The distinguishing characteristics of thrown and thrust osseous points are length (thrown are 10-25 cm long, thrust are 25-40 cm long) and curvature. All thrusting spear points are curved. The beveled haft element is on the outside of the curve of all ivory points longer than 25 cm without exception. All known thrusting spear points have been recovered underwater in Florida's rivers and are made of ivory. Further, the long, curved ivory thrusting spear points are oriented so that the point was distal and the haft was proximal within the original tusk. Careful attention to anatomical details insured these tools functioned efficiently. The three-tiered weapons system hypothesis begs the question: Why make both bone and stone tipped spears?

A plausible explanation for the co-occurrence of bone and stone points in archaeological assemblages using ethnographic and historic examples is suggested (largely drawn from Ellis 1997 and Knecht 1997). Stone points have a large entrance profile and cause severe damage. However, they are brittle and can break, potentially leaving you nearly defenseless, or unprepared to hunt if stone point manufacture failures are not overcome. Bone points do not cause the severe damage and gaping wounds of stone points but are less prone to breakage during manufacture and use. The acceptable compromise is a needle like projectile at the end of a hand held spear used for close quarter dispatching or defense. The long slender ivory points will not fly properly because of the curvature. Essentially they function much in the same fashion as a pitchfork tine, creating a small but deep wound with a reliable weapon. The shaft diameter expands from the point to the haft element, which will essentially plug the wound by stretching it on the way in. This allows the point to be removed without hindrance. There is no reloading foreshafts, this weapon is designed to be used repeatedly. The shorter straight points effectively fill the same need as Clovis points while the longer curved points are an additional line of effective weaponry. Clovis points and the straight launched points were not intended to be removed from the target. The barbed ivory point clearly demonstrates the projectile was expected to remain with the animal.

Conspicuous Lack of Post Clovis Extinct Faunal Associations

In compiling Appendix 2 approximately 200 additional faunal lists were consulted from Middle and Late Paleoindian locales (or levels in multicomponent sites). Nearly half of these were Folsom sites. The vast majority of Folsom sites will contain *Bison antiquus* or *occidentalis* if there is any bone preserved. No other extinct animal occurs as more than fragmentary bones of a single individual at any post-Clovis archaeological site. Each example of later diagnostic Paleoindian materials found with extinct animals is included in Appendix 2. Differential bone preservation, fragmentary elements of single individuals, and lack of modification seem to indicate that no one after Clovis encountered these animals alive or as desiccated carcasses available to be scavenged for tool manufacture.

The possibility exists that Goshen is in fact a very Late Pleistocene culture that might have seen the fauna about to go extinct, but this is far from resolved. Bones of extinct Rancholabrean fauna at Mill Iron, Hell Gap, and Carter-Kerr/McGee suggest chronological overlap only from incomplete animal remains (Frison 1991; 1996). Also, the Jim Pitts Site, South Dakota has an entirely Holocene faunule (Donohue and Sellet 2001). Perhaps Goshen people actually saw the last mammoth in North America. Direct dating of additional proboscideans should help determine if serial or clinal extinction occurred that can be matched with changes in cultural adaptations.

Gainey Faunules

Gainey or Gainey/Clovis points seem very closely related to typical Clovis material but are never quite the same in morphology or in the reduction strategy followed to create them (Lepper and Meltzer 1991; Tankersley and Isaac 1990). Fauna associated with Gainey may indicate essentially a Holocene occupation of Northeastern North America. Dan Fisher's (Fisher 1995, Fisher et al. 1991) work on mastodons across Michigan and Wisconsin is particularly tantalizing due to the lack of unequivocal artifacts, let alone diagnostic artifacts. Typically these sites are thought to predate Clovis, there is no local Clovis, and then we see Gainey with Holocene fauna. Gainey is essentially a geographical and temporal variant in the same way the excurvate sided Clovis points from Arizona, New Mexico, Texas, Louisiana, South Carolina, Ohio, and Florida may represent a distinct "tradition." However, there is a fundamental difference in that Gainey appears after the Pleistocene extinctions have occurred based on preserved animal remains recovered to date (Gramly 1996; Storck and Speiss 1994). This distinction is probably critical in actually separating Clovis and Gainey points from Clovis and Gainey culture. While the points are arguably very similar or identical within a broad range, the specific diet has changed. Caution is urged to avoid making too much of this pattern based on the limited preserved Gainey fauna.

There is a strong association with Gainey points and caribou, essentially a Late Clovis post-extinction phenomenon. Caribou are present at only 12 archaeological locations in North America:

Broken Mammoth, AK		lanceolate points	+birds, many mammals
Bull Brook, MA	X	Gainey?	+beaver
Debert, Nova Scotia	X	Debert/Clovis	+caribou blood residue on points
Dutchess Quarry Cave 1 NY		Gainey?	+0 other fauna
Dutchess Quarry Cave 8 NY		Gainey?	+0 N.B. Cave 3 fish and bird
Hiscock, NY		Clovis/Gainey?	+birds, moose, mastodon, small mam
Holcombe Beach, MI	X	Gainey?	+0 other fauna
Manis, WA		none	+duck,O.z., B.a. and mastodon
Sheriden Cave, OH		Clovis/ other?	+many amphibians, reptiles & mam
Udora, Ontario		Gainey/Clovis?	+fox, hare and deer
Vail, ME	X?	Clovis/Gainey?	+0 other fauna
Whipple, NH	X		+0 other fauna

Based on patterned faunal associations with extant taxa Gainey appears to be technologically Clovis immediately after the Pleistocene extinctions. That is to say there has yet to be a technological or adaptational response to the reduced diet available in the earliest Holocene. Projectile point data and faunal associations need to be incorporated into assemblage level analysis but at present the notion of Gainey as regional Early Holocene(?) Clovis seems tenable. At the very least this idea can be tested.

Other non-Clovis lanceolate and fluted point varieties appear to be Clovis derived technological responses to the changing Holocene environment. Dalton material is not associated with any extinct Pleistocene fauna (Morse 1996:426). Cumberland points are not associated with a single edible species of plant or animal so their position remains indeterminate. After the Pleistocene fauna are extinct "a subsistence strategy that resulted in sustained chronic malnourishment would be replaced" (Dunnell 1979:132). Many of the heavily exploited resources of Chapter 2 were simply no longer available. The necessary dietary change would force the subsistence strategy of Clovis people to adapt in response to changing conditions. The shift in technological adaptation may be visible on different Clovis and Gainey point forms and variation in blade production strategies.

Gathered Plant and Animal Resources

The notion of gathered animals implies simply that specialized procurement equipment was not necessary for the acquisition of some specific resources. Gathered animal resources observed from Early Paleoindian sites discussed in Chapter 2 include: the invertebrates, amphibians, reptile eggs, turtles, snakes, and possibly sloth (Martin 1984). This is in addition to the wealth of plant resources clearly utilized by Early Paleoindians.

George Frison takes the notion of gathered animals slightly further by including snares for woodrats as a gathered resources rather than a hunted resource (Frison

1991:328). Snares, traps and nets could be employed by virtually any member of a group but they are still hunting techniques that require simple, but specialized equipment. The gathering-hunting distinction is not important. The evidence of utilized plants and animals demonstrates that all but the youngest demographic cohort could contribute to the subsistence of the group.

Age and gender task separation must have been present but are unintelligible archaeologically. Our best guesses will of necessity come from historic and ethnographic analogy. However, we lack means to ascertain the veracity of these analogies separated by a gulf 13,000 years wide. Without delving into rampant speculation it is simply worth noting that numerous plant and animal resources were clearly utilized by Early Paleoindians that could be acquired without the use of any tools or weaponry by any ambulatory member of society.

Summary

Broad spectrum generalized foraging of Clovis people continent wide is generally similar to more familiar examples from the Archaic (*sensu* Willig 1990:55). However, there are important differences worth stating: First, the known Early Paleoindian diet breadth is exceptionally large, 116 species utilized of 352 species directly available. The Pleistocene extinction event severely restricted the number of species available to all peoples after Clovis. Secondly, within North America the Clovis technological adaptation is not constrained by ecological boundaries in the same fashion that essentially every other known archaeological and ethnographic culture seems to be circumscribed. Clovis points, osseous points and rods, bifacial core reduction patterns, polyhedral blade core reduction patterns, artistic design, and biotic resource exploitation patterns are remarkably consistent across a large geographic expanse for a period of maybe 800 years (Ferring 2001; Haynes 2003; Meltzer 2004; Tankersley 2002).

The assertion by Meltzer (Meltzer 1993a; see also Meltzer and Smith 1986; Dincauze 1993) that Eastern Clovis people engaged in a generalized foraging subsistence adaptation is equally demonstrable at numerous Western Clovis sites such as: Lehner and Murray Springs in Arizona (Haury 1956; Haury et al. 1959); Blackwater Draw and Burnet Cave, New Mexico (Hester 1972; Howard 1935); Dietz, Oregon (Willig 1990); and at Aubrey, Lewisville, Lubbock Lake, and Wilson-Leonard, Texas (Collins 2001; Crook and Harris 1957; Ferring 2001; Johnson 1987). These nine sites not only have a large diverse fauna but also have a broad range of clearly utilized fauna beyond the Proboscideans.

Clovis material culture exhibits continuity across the continent in several different artifact classes: multiple co-occurring stone projectile point forms; multiple osseous projectile forms; repeated occurrence of like bone rods; widespread manufacture and use of distinct polyhedral blade cores and blade tools; and repeated utilization of specific lithic and bone reduction techniques across the continent in numerous media are only a few of the data classes shown to occur wherever Clovis appears. Very little from any given Clovis site is unique. If a type of artifact or behavior is found in one place there is a very good chance it has already been documented in several other Clovis sites as well. This attempt to compile all such records in one place allows us to see the whole picture at once for the first time.

A tremendous amount of compiled information about Clovis dietary resource exploitation exhibits several continent wide patterns as well: Proboscideans were exploited by Early Paleoindians everywhere they have been found together (n=33 states currently); numerous gathered plants and animals greatly expanded the Clovis diet breadth beyond even the large array of exploited bigger mammals. The specialized technological adaptation and patterned deployment of that technology facilitated a patterned species rich foraging subsistence adaptation.

Several final categories of data regarding site positioning and clustering of material remains demonstrate that consistent patterning of Clovis artifacts and behavior traits indicate Clovis culture is an internally consistent phenomenon even though it is spread thin across the landscape. However, it is absolutely critical to keep in mind that "the Clovis adaptation" is not necessarily equal to "the Clovis people" in the form of a single biologic population. In some respects we are limited only to normative or essentialist qualities for our archaeological cultural constructs. There is nothing wrong with that as we only recover a limited set of data from the original culture. Asserting that Clovis is a culturally united continent-wide entity does not mean we have any idea of how many groups of genetically or linguistically distinct populations we are examining. The archaeological data marshaled here are simply not capable of addressing that question directly. The Old and New Clovis section in the next chapter might actually mirror biological lineages but we have no mechanism to independently test the idea. We have a tremendous amount of work to do to truly comprehend what we already know from the material recovered in the last 100 years. Clovis cultural patterns presented in the final three chapters indicate widespread utilization of a specific cultural adaptation over much of North America nearly 13,000 years ago.

CHAPTER 5
CLOVIS CULTURE

Introduction to Clovis Culture

A limited number of additional aspects of Clovis landscape use and behavior patterns are considered as they are able to show that broad cultural patterns of the Early Paleoindians extend beyond mammoths being repeatedly hunted with Clovis brand points. Early Paleoindian art, cave and rockshelter use, caches, site rarity, mobility, possible regional traditions, and Clovis aggregation behavior indicate that a web of patterned behavior among Early Paleoindian people was part of the Terminal Pleistocene cultural adaptation.

Early Paleoindian Art

In sharp contrast to other shared aspects of their Old World progenitors, Clovis people are generally considered to have exhibited limited interest in artistic expression (Haynes 2002; Meltzer 1993a; Tankersley 2002). Slowly accumulating evidence from across the continent indicates that while not pervasive there is solid evidence for a wide range of artistic expression by Early Paleoindians in North America. Numerous shaped objects and drawings have been found at Clovis sites across the breadth of North America. Figure 5:1 shows the 12 states where artistic objects or embellishments have been found at Early Paleoindian sites. Admittedly there is only sparse evidence in the Eastern United States but the documented examples are not insignificant.

Stone cobbles or pebbles with incised geometric patterns are the best known form of Early Paleoindian art and have been found in Texas and New Mexico. A single example is reported from Blackwater Draw (Hester 1972). More than 40 are now known from Gault (Collins et al. 1991:15; Collins et al. 1992). The example from Wilson-Leonard is problematic in that the associated points fall within a nebulous Folsom-Goshen-Midland form that is not Clovis but might be contemporaneous (Collins et al. 1991; Collins 1999). The Wilson-Leonard specimen is engraved with rectangle patterns similar to at least two examples from Gault (Collins et al. 1991: Figure 1 C and E). Incised pebbles have also been found at Levi Rockshelter but the associated level is not clear (Alexander 1982; Greer and Treat 1975).

Incised geometric designs have been noted on a small number of bone and ivory tools from Washington and Florida. Two of the bone rods from East Wenatchee have a "zipper" design carved down the length of one side (Gramly 1993). Simple linear cuts near the hafting end of a straight ivory point from the Aucilla River, Florida are thought to represent "tally" marks (UF#123723). The surface is eroded but five and three cuts on each lateral side are still clearly visible (UF#123727 Ellis Moore #15). The large complete Ohmes ivory point from Sloth Hole has a zigzag design repeated on each lateral side near the haft end as well (UF# 136494) (see Haynes 1982 or Webb and Hemmings 2002). The better preserved side has 28 up and down strokes done in one fluid motion. The zigzag design is also carved on the lateral sides of a proximal *Odocoileus* metatarsal

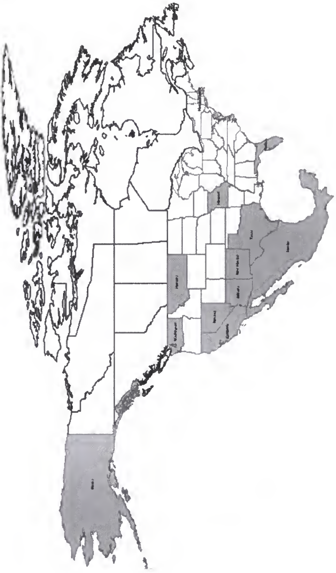

Figure 5:1 Distribution of Clovis art

dagger fragment from Sloth Hole in the Ohmes Collection of the FLMNH. This artifact awaits direct dating before it will be suggested to be a Clovis bone tool but the artistic similarity is striking.

The *Odocoileus* humerus from Jacob's Cavern, Missouri also has the same "zigzag" design carved on one side (Allison 1926:327). The inclusion of the zigzag design element, 85 years before anyone would know to check for it, argues heavily in favor of this artifact being real. The most important artistic element is of course the image believed to be a mastodon. If determined genuine this would be the first evidence of human and mastodon association found, albeit belatedly conceded. Direct radiocarbon dating now seems unlikely as the bone was soaked in paraffin (Allison 1926:328).

Stone, bone, and ivory beads or bead preforms have the broadest geographic distribution of any Clovis art class. They have been found in Alaska, Nevada, New Mexico, Massachusetts, and Florida (Gramly 1998; Hester 1972; Holmes et al. 1996; Wheeler 1942). Of particular interest is the Clovis stone bead from the Sugarloaf Site, Franklin County, Massachusetts. A drilled stone bead was found with one complete Bull Brook style felsite Clovis point, whose source is 100 km east (Gramly 1996:21). The bead and other artifacts were found in a hearth with calcined bones (cervid was noted) and charcoal (Gramly 1996). The very faintly tapered hole is identical to those drilled in the *Equus* daggers discussed earlier (Gramly 1998:49). The doughnut shaped bead is nearly a centimeter in diameter. The failed ivory bead performs from Sloth Hole would have made a bead of very similar dimension.

The *Canis* mandible ornaments and *Palaeolama* coyote head carving are well shaped portable art objects whose exact functions are unclear (Aveleyra 1965; Webb and

Hemmings 2002). The round bone disk from the Butler Site, Florida likely served some equally inscrutable artistic purpose. The bone disk might be a toy or gaming piece.

The Goshen level pendant from the Mill Iron site is included until the Clovis-Goshen relationship is better understood (Frison 1996). Because this artifact is not shown it is impossible to determine how similar or different it is from the other beads and drilled Clovis artifacts. The drilled bones from Potter Creek Cave are likely to be unfinished objects or very simple ornaments whose iconographic value is entirely lost today (Putnam 1906).

The Murray Springs bone wrench may be both a tool and artistic implement. Similarity to Old World "batons of commandment" has been noted (Haynes and Hemmings 1968; Pidoplichko 1998). In much the same vein the oversized Clovis points usually, but not always, found in cache sites likely served a dual purpose. They are both functioning tools and exaggerated examples of the knappers craft with obvious display value (Frison 1982; 1991; Gramly 1003; Hyland et al. 1992).

A final item typically found at intentional interment or cache sites that likely had artistic value to Early Paleoindians is red ochre. Its widespread presence is delineated in the cache section and is not included here with more obviously fashioned artistic artifacts (see Tankersley 2002). Artistic use of red ochre is by no means a diagnostic Clovis trait but it clearly was important within their culture (Roper 1987; 1996; Tankersley 2002; Wreschner 1980). Its repeated association and application to large Clovis points at six of the cache sites discussed shortly appears to indicate enhancement for their display value either here or in the afterlife.

The combined artistic endeavors of Clovis people across North America clearly indicate a diverse, sophisticated tradition well beyond the scope of simplistic interpretation 13,000 years removed. The lack of identified wall art is surprising considering the number of cave and rockshelter sites discussed in the next section. In the lack of wall art, Early Paleoindians seem disconnected from their Old World antecedents (and unknown possible intermediaries). The limited amount of portable art objects and iconographic representations include nothing that would be out of place in an Upper Paleolithic assemblage from Eurasia. The intent is not to stress the potential relatedness but rather document that artistic expression survived in the New World and was not simply independently invented again by Paleoindians.

Cave and Rockshelter Use by Early Paleoindians

Nearly one third of the Early Paleoindian sites listed in Appendix 1 have lake, spring, or some fluvial, erosional feature included in their name. Typically Clovis sites are found in direct association with waterbodies, or extinct waterbodies. This correlation is particularly tight in the Southern Plains and greater Southwest at sites where mammoths were either surprised, or retreated to, after adverse encounters with Clovis hunters.

In some respects this observation may account for the impressionistic view that Early Paleoindians infrequently or never occupied caves and rockshelters. However, there is considerable evidence for cave use by Clovis, other closely related early groups (Gainey and Cumberland), and several unidentified Pleistocene peoples. Thirty-three individual cave and rockshelter sites have evidence of their use by Early Paleoindians at the end of the Pleistocene. Diagnostic Clovis stone and ivory tools have been found in 12 of these sites. The geographic distribution of these sites essentially fills the area not occupied by the Plains (Figure 5:2). The 15 American states and British Columbia are scattered enough to indicate that cave occupation was a regular part of Early Paleoindian habitation practices. Thirty-three sites is a small percentage of all known Clovis sites but again the accumulated evidence is not insignificant.

Austin Cave in Tennessee must be considered highly important both for being a Clovis cave site in Eastern North America and also for the preserved organic remains. Hickory nuts were utilized as well as several animals whose unidentified remains sorely need publication (Barker and Broster 1993, Barker 1994). Other Clovis cave sites are located in British Columbia, Wyoming, Utah, Arizona, New Mexico, Texas, Ohio and Florida.

The cave and rockshelter sites listed in Table 5:1 include data on associated diagnostic artifacts when available. An equal split between Clovis, other, and unknown cultures is shown at present (11 each).

An impact-damaged Clovis point was found in a hearth with remains of numerous extinct animals, included an extinct musk-ox (Howard 1935; Schultz and Howard 1935). The context, associations, and cultural modification clearly demonstrate this was a closed context Clovis discovery. At a minimum the thoroughly identified animal remains should be examined for evidence of human modification (Schultz and Howard 1935). The single Clovis point and possible bone tools are the only reported artifacts. The lack of stone debitage seems likely to indicate the dirt was never screened which might still be a productive enterprise.

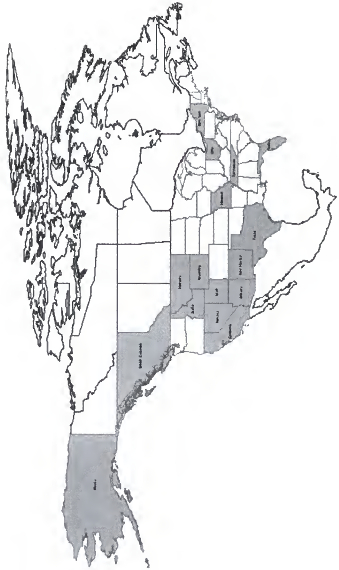

Figure 5:2 Early Paleoindian cave and rockshelter sites

Table 5:1 Early Paleoindian cave and rockshelter sites

Site Name	**State**	**Tools**	**Fauna**	**Comments**
Anzick Burial in rockshelter	MT	C8 100+	Bone tools	Not exactly a living surface
Austin Cave (40RB82)	TN	C2+16 pref.	Yes uid	Clovis, hickory nuts recovered
Blackhole Cave Auc3A	FL	Bifacial core	Probo X	Ivory tool fragment. Inundated
Blacktail Cave (24LC151)	MT	Go/Pln 1/2	Many sp.	Goshen or Plainview 1 or 2
Bonfire Shelter	TX	C1? Pre-Fol	Mammoth	Truly Clovis?
Burnet Cave	NM	C1	Musk ox	Clovis
Charlie Lake Cave	B C	Cx?	HELP	Clovis
Conkling Cave/Bishops Cap	NM	None	Eq/cam/N.s.	Human bones but no artifacts
Dry Creek Cave	AK	Fluted tri<	Bones	No fauna listed
Dutchess Quarry Cave #1	NY	Fluted	Caribou	Gainey?
Dutchess Quarry Cave #8	NY	Fluted	Caribou	Gainey?
Fenn Cache possibly	WY*	56 items	Leather?	Clovis, possibly bag in cave-rumor
Fishbone Cave	NV	Uid	Eq/cam+	Levels 3 and 4 unidentified culture
Hidden Cave	NV	?	Yes uid	UC Berk 1951 Fauna?
Horn Rock Shelter #2	TX	1 lanceolate	Many sp.	Unfluted Clovis/Suwannee
Jacob's Cavern	MO	Pleist. Art	Ov,Ma+	Deer humerus art, truly Clovis?
Kaufmann Cave 48SH301	WY	G1	Mam but?	1 Goshen point
Kincaid Rock Shelter	TX	C1-3	Camel+	Clovis 1 to 3 variously reported
Leonard Rock Shelter	NV	?	Uid	Heizer 1951
Levi Rock Shelter	TX	C3	Many ext.	Clovis and/or Midland/Goshen
Little Box Elder Cave	WY	None	60sp. uid	Weak site
Lovewell Cave	NV	?	?	Stanford and Jodry 1988
Manzano Cave	NM	Sandia	Cam, sloth	Sandia fake? Worm57, Hibben 41
Potter Creek Cave	CA	C? uid	Ma+21 sp	Drilled bones, limited artifacts
Sandia Cave	NM	Sandia	Many	Sandia site fake?
Sandia Cave	NM	Folsom	Many	Faked site? N=?
Sheriden Cave	OH	C1 or 2?	Many	Clovis, 2 bone points many animal
Silver Springs Cavern	FL	C,Su, Sim?	Ma, Eq.+	1 Fluted= Clovis, inundated site
Silverhorn Rock Shelter	UT	C1 + lance	Yes uid	Clovis, may be Folsom (C>F here)
Smith Creek Cave	NV	None?	Eq cam+80	Limited archaeological data
Trail Creek Caves	AK	?	Yes uid	Helge Larson 1968(dug in 49)
Ventana Cave	AZ	C1	Many sp.	Clovis 1 point, some extinct fauna
Wasden – Owl Cave	ID	Folsom 4	Mammoth+	Highly suspect association
Wilson Butte Cave	ID	Pre-Clovis?	Many sp.	14.5 many problems
Totals: 33 sites, 34 occupations	15+bc	8 cultures + unknown	Most some extinct	C11, Pre-C1, Goshen2, Gainey2, Folsom1, Sandia 2, Unknown 11

*Indicates site discussed here and in text but not in Appendices 1 and 2.

Kaufmann Cave (48SH301), Wyoming, and Blacktail Cave (24LC151), Montana are Goshen (or Goshen-Plainview as the case may be in Blacktail Cave) sites with faunules that may include extinct forms, such as mammoth in Kaufmann Cave (Davis 1986; 2000; Davis et al. 1985; 1996).

Several of the unidentified cultures occupying caves leave some doubts regarding the occupations. Fishbone Cave, Nevada in particular has a rich Pleistocene fauna, burned dung, and plausible bone tools that need further examination and publication (Orr 1956; 1974). The Pleistocene fauna assemblage of Sandia cave seems plausible but the archaeological material will probably remain doubtful (Hibben 1941; Thompson and Morgan 2001).

The distribution of utilized caves and rockshelters seems to indicate that when available they were inhabited by Early Paleoindians. Because they represent so few of the known Early Paleoindian sites it is doubtful Clovis people considered caves a preferred camping space. However, it is important to distinguish minimal use from actual avoidance. Clearly, protected spaces were regularly occupied in some areas. Rockshelters and caves would be logical habitation sites during winter months. The important issue of cold weather habitation loci is rarely considered for Paleoindians (Gramly 1998).

Clovis Artifact Caches

Concentrations of tools or a superabundance of artifacts within a site do not necessarily indicate caching behavior on the part of Early Paleoindians. Quarry sites represent a logical concentration of artifacts that would not be interpreted as intentional caching. In our interpretive attempts to account for prehistoric behavior simple concentrations of a specific artifact are espoused as caches. A plausible case for an ivory tool cache could be made for Sloth Hole (8JE121). Thirty-three individual ivory points have been identified along with 67 additional non-mending fragments in a circular sinkhole 52 m in diameter. Sloth Hole is not an ivory tool cache, it is a Clovis habitation site that includes an area identified as an ivory tool manufacturing loci (Hemmings 2000).

The range of materials expected to be included in the typical working toolkit of an individual or larger social unit is basically unknown for Early Paleoindian societies. How many flake tools, various stage bifaces, and finished points should we expect to find together in a persons toolkit? Anzick may indeed be the most accurate view of an individuals personal gear we have yet encountered (Owsley and Hunt 2001; Wilke et al. 1991). Rummells-Maske, Iowa is also suggested to represent an individual toolkit rather than an intentional cache.

Those Clovis artifact concentrations that appear to have been intentionally interred, most of which were expected to be utilized in the future, are discussed below. The Anzick human burial represents a nebulous position in that the objects and person were intentionally interred but not likely to have been exhumed. Jones and Bonnichsen (1994:43) raise the question "could the other caches be other Clovis burials that lack human skeletal remains?" The presence of bone tools at three additional cache sites seems to indicate intentional interment of these artifact groups that facilitated preservation of items that are typically long deteriorated in archaeological sites. If human burials were originally included in the cache sites it seems unlikely that bone tools would survive but not other skeletal material, especially teeth.

A further note of importance is that caching behavior is not strictly subsistence related. The manufacture of stone and osseous tools of course is usually subsistence related but intentionally interring them, often decorated with red ochre, indicates planning and forethought beyond a hand-to-mouth existence. The purpose of the known "caches" is further obscured in time by the observation that the people intending to use them did not in fact recover them.

Currently nine caches that include diagnostic bifacial Clovis artifacts are known to archaeologists. Summary details of each are included in Table 5:2. Several of the Clovis blade localities included in Table 5:1 may properly be considered caches but are not included in the cache site list because: they are typically under or unreported and therefore not equably comparable to the other caches. Also, the specific reduction strategies, intended functions, and depositional processes are not equivalent between blade and biface concentrations. Specifically, Clovis blades appear to have been recovered from contexts of intentional caches as well as intentional discards, and accidental loss. The bifacial tool caches of Table 5:2 appear to have been intentionally interred rather than simply lost or discarded.

The presence of bone artifacts in four of the nine Clovis caches is highly suggestive of intentional interment of the artifacts due to the rarity of these items in regular kill and camp sites. If the organic tools are not buried rapidly they will not be preserved in the archaeological record. Patterned usage of red ochre at six of the ten sites further strengthens the intentional interment argument. The lack of red ochre evidence on four of the caches is simply that, an absence of evidence, not evidence of absence. Even the absence of red ochre is restricted to the three southernmost caches (Drake and Watts in Colorado and Gault in Texas). This pattern may have as much to do with preservation and discovery as with past behavior. Busse is the southern-most Clovis use of red ochre yet know (Roper 1996:41). Sheaman is the only known non-cache occurrence of red ochre (Roper 1996:41). The Cooper Site, Oklahoma, is the only Folsom use of red ochre yet found at any kill site (Carter and Bement 1996:109). Red ochre does appear at many Folsom habitation sites, particularly larger ones (Roper 1996).

The East Wenatchee site is particularly tantalizing for the presence of debitage and the considerable amount of tool use prior to burial. Furthermore, as the only *in situ* discovery of even portions of the cache, the inscrutable behavior reflected in the archaeological record is complicated by the surrounding site. Feature 1 contained 57 recovered objects and there are more within the undelineated site surrounding the "cache" pit (Gramly 1993:6). Although the points are exceptionally large, they were used as the blood residue and resharpening evidence indicate (Hyland et al. 1992)

Table 5:2 Clovis artifact caches

Site	State	Number of Items	Red Ochre	Bone Tools	Comments
Anzick Burial	MT	100+	Yes	11 pieces mni 5 max 7	8 points, 70=68 bifaces, 25 fl-fl tools. 39 Chalcedony, 30 moss agate, 1 porcellanite MT-WY
Busse	KS*	90, 13 bifaces	Yes on 10+		Niobara (Smokey Hills) jasper 90-100km S, worn tools, no points.
Crook County	WY	12+?	Yes	3? Gone	1 Clovis, 8 bifaces, 500km SW. Buried in ochre source.
Drake	CO	15+?		1?	1 Ivory tool? 13 points 1chert hammer. 11 Alibates dolomite 560km SE
East Wenatchee	WA	57+ site	Yes C2	14	14 Clovis, 16 bifaces, 6+blades
Fenn	Wy or ID	56	Yes on 55		Obsidian se ID, Green River chert sw WY, red jasper n WY, quartz, ec Utah Agate (stuffed olive dots), 18lbs+ Discovery ?'s nag.
Gault	TX	5, 1 point	?	1 not related	4 Bifaces, 1 Large point Gaines de Graffenried to Skeet Simons
Simon	ID*	29-33 or 34 items	Yes		5 Clovis, 24 Bifaces, 4? quartz bi 33+ scraper + spall=35?
Watts (Timnath)	CO*	6	? pat.		3 Bifaces, 3 Preforms Hartville chert & quartzite- Glendo WY 170 km N
9 caches	8/9	6-100+	6 of 9	4 of 9	

* indicates site included here and in text but not in Appendices 1 and 2.

Figure 5:3 indicates the somewhat restricted range of distribution among the Clovis caches. Only Texas is not directly contiguous with the block of states and that only by the width of the Oklahoma panhandle. Colorado has been remarkably absent from much of the discussion of Clovis subsistence and culture in this work yet more than 20% of the caches have been found there (in Logan and Larimer Counties).

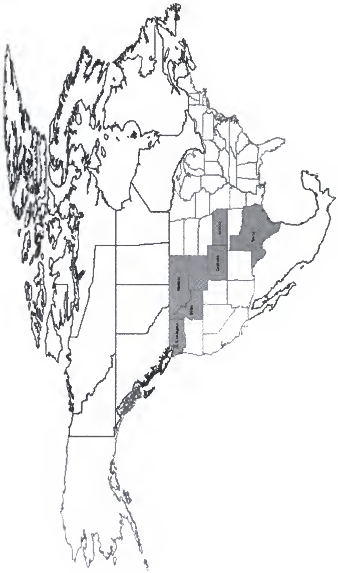

Figure 5:3 Clovis artifact cache sites

The Fenn Cache was said to have been found in a skin bag in a cave (Frison and Bradley 1999). It contained 56 items: 22 points, 32 bifaces, 1 blade, and 1 bifacial crescent (Frison and Bradley 1999; Tankersley 2002). Two of the Fenn point bases are deeply concave in the same fashion as the Colby points. Both sites include Clovis points made from the same red jasper as well (Frison and Todd 1986; Frison and Bradley 1999).

Several additional concentrations of Clovis artifacts may indeed be actual caches and are mentioned here in order to keep them part of the discussion. Other sites with highly concentrated stone artifacts include: the Pelland Blade Cache, the Kevin Davis Blade Cache, the Blackwater Draw Blade Cache, Pavo Real, and Udora.

Another problematic "cache" is Rummells-Maske (13CD15) which contained 20-22 fluted points, one unifacial flake tool, and seven debitage flakes (Morrow and Morrow 2002). Several of the points have highly polished "bag wear" spots but are otherwise freshly finished points that lack resharpening evidence. They are mostly manufactured from Burlington chert which occurs no closer than 56.4 km south (Morrow and Morrow 2002:313). Three Clovis points are made of Verdi chert from 80.5 km away (Morrow and Morrow 2002:314). Point length varies from 6.8 cm to 12 cm. This site appears more likely to represent an individual toolkit that had traveled together during the normal life cycle of the tools. What is exceptional, and difficult to interpret 13,000 years later, is that it was found together.

Normal habitation and activity sites can include concentrations of particular artifact types as part of normal day-to-day activities at a site without demonstrating specialized caching behavior (Collins 1999). Everyday objects made in oversized form clearly had cultural currency beyond their utilitarian functions, such as the East

Wenatchee points (Gramly 1993). The interment of red ochre covered objects with burials (Anzick) and unrecovered tool caches (n=5) may indicate they were actually never intended to be used again.

Actual Rarity of Clovis Sites and Points

The repeated misinterpretation of the absence of evidence to somehow indicate prehistoric behavior has severely skewed our collective view of Paleoindians in North America (*sensu* Grayson and Meltzer 2002; 2003; Meltzer 1989; 1993a; 1993b; 1993c; 1995; 2004; Meltzer and Smith 1986).

A false behavioral dichotomy is advocated for Early Paleoindians east or west of the Mississippi by Frederick Ward (West 1981:370 Table 18:1): Sites lacking bone, all in Eastern North America, are considered habitation sites while sites with good concentrations of bones are considered to be kill sites. The preservation of bone or effects of site formation processes are being confused with evidence of adaptational behavior. An informative exercise would be to plot the artifacts from various known western Clovis kill sites and see if the distribution patterns match any of those observed at sites with only stone artifacts. Can we determine if there is an intrasite distributional signature to kill sites?

Lacking bones, Dent is a fluted point isolated occurrence (n=3 Clovis points). A similar situation exists at Colby: the artifact assemblage consists of four Clovis points, three flaked stone tools and tool fragments, and 30 debitage flakes (Frison and Todd 1986). In addition, a few more equivocal bone and unmodified stone tools were recovered (Frison and Todd 1986). Naco is a third example of archaeological interpretations of Clovis behavior being discernible only because of fortuitous bone preservation. Eight Clovis points and no other reported artifacts were recovered at Naco (Haury 1952). It appears that the Naco mammoth was mortally wounded but managed to elude pursuers. Gorman notes that the African elephant response to surprise is to "habitually charge" the attacker and then flee for miles (Gorman 1969:96 citing Carrington 1958:153).

Adaptational interpretations based on archaeological data of Eastern Clovis sites need to be considered highly suspect because the picture is so incomplete. The archaeological sites represented by three or fewer diagnostic Clovis points clearly indicate that low artifact frequency is *not* simply a function of limited site activity (see Table 5:4 below). This dilemma is particularly acute at smaller sites, especially those that might regularly be considered isolated finds in the Eastern United States simply because they lack anything organic.

The difficulties of interpreting many sites in Eastern North America are easier to comprehend by studying Table 5:3. Numerous well documented Clovis sites across the continent have produced very limited numbers of diagnostic Clovis artifacts. Several exceptionally important sites such as Lubbock Lake, Shawnee-Minisink, Burnet Cave, Lewisville, Sheaman, Ventana Cave, Sheriden Cave, McLean, and the Crook County Cache contained only a single Clovis point each.

The scarcity of Clovis points across the entire landscape of North America is more clearly recognized when some of the regional and state-level fluted point totals are examined. Bruce Huckell's Arizona Fluted Point survey only has 64 points (Huckell

1982). Gary Haynes states Clovis points are rare on the Southeastern Gulf Coastal Plain yet we have more than Arizona in Florida alone (Dunbar 1991; Haynes 2002).

The Alabama point survey recorded 1654 fluted points (Clovis, Cumberland, Redstone), 1260 (76%) were from just three counties in the extreme northwest portion of the state (Futato 1996:307). Data collected during the Mississippi point survey documented 122 Clovis finds state wide, with 82 (67%) from the northern part of the state (McGahey 1996:356). This concentration mirrors the northwest Alabama survey data albeit with a much smaller collected sample (Futato 1996). The Tennessee point survey documented 654 Clovis points for the state from 29 sites and 63 locales (Broster and Norton 1996:288).

A total of 250 fluted points are known in Iowa but the Clovis number was not specified (Morrow and Morrow 2002:314). A total of 62 documented Clovis points are from Kansas (Hofman and Hesse 1996:23). Over the same area 38 Folsom points were known at the same time (Hofman and Hesse 1996:24). Only 90 Clovis points were recorded in Oklahoma, with length ranging from 3.6 to 15.7cm (Hofman and Wyckoff 1991:29).

One particularly striking site is Dietz in Oregon. This site alone has 60 Clovis points and 25 preforms while the remainder of the entire state has only 20 Clovis points (Fagan 1986 and 1988). A single group of people would seem to be suggested by this concentration.

The frequency of Clovis points within specific sites and across individual states is the only direct evidence we have to assess populations, despite the obvious shortcomings of such an approach. Points can not be equated with people but the range

Table 5:3 Well documented Clovis sites and actual point frequency

Site	State	N=_	Comments
12 Mile Creek	KS	1	12 bison
Adams Quarry related	KY*	40	
Angus	NE	1	1 mammoth
Anzick Burial Cache	MT	8	100+ total items, 11 bone tools
Big Eddy Site 23CE426	MO	4	Fragmentary, unlisted fauna
Blackwater Draw	NM	28	15 mammoth + many other species, tools
Boaz	WI	1	1 mastodon
Bonfire Shelter	TX	1	May not be exactly Clovis point
Burnet Cave	NM	1	Many faunal species
Carson Conn Short Quarry Related	TN*	27	Other tools, no fauna recovered
Casper Site	WY	1	Clovis below Hell Gap level
Colby	WY	4	7 mammoths +more sp +30 flakes 5 tools
Crook County Cache	WY	1	8 bifaces, 3 bone tools
Debert	NOVA	25	Maybe 26, limited fauna
Dietz Quarry related	OR	60	+25 preforms
Dent	CO	3	15 mammoth
Domebo	OK	5	4 complete, 1? Mammoth
Drake	CO	13	1 bone tool
Dutton (not Selby)	CO	1	1 mammoth
East Wenatchee Cache	WA	14	14 bone tools
Escapule	AZ	2	1 mammoth runnoft
Fenn Cache	WY/ID	56	Possible cave with leather bag
Gault (+Gault Cache) Quarry related	TX	36/+1	Many species, 1 bone point
Hiscock	NY	6?	Clovis>Gainey? 9 mastodon + other sp.
Horn Rock Shelter #2	TX	1	May not be exactly Clovis point
Jake Bluff	OK	2	15 bison
Kimmswick	MO	4	Total for site. 2 mastodon
Kincaid Rock Shelter	TX	1-3?	Variously reported
Lange/Ferguson	SD	3	2 mammoth + many other species
Lehner Ranch	AZ	13	13 mammoth only 3 w/Clovis +many sp.
Leikum	AZ	1	1 mammoth
Levi Rockshelter	TX	3	2 levels with many faunal species, burned?
Lewisville	TX	1	21 hearths, many species present
Lubbock Lake	TX	1	3 mammoth +many other species
Lucy	NM	2	1 mammoth bison –mixed?
McLean	TX	1?	1 mammoth
Miami	TX	3	5 mammoth
Mockingbird Gap	NM	248	182 complete 66 tips
Murray Springs	AZ	20	4 mammoth, 11/12 bison + other species
Naco	AZ	8	1 mammoth runnoft
Navarette	AZ	1?	1 mammoth
Parrish Village	KY	8	No fauna listed (Webb 1950)
Pavo Real	TX	3+?	Bison +uid mammals
Shawnee-Minisink	PA	1	Many small species
Sheaman (Agate Basin Area 9)	WY	1	Mammoth, bison, pronghorn + other species
Sheriden Cave	OH	1	>40 peccaries, 2 bone points +other species
Simon	ID	5	33 or 34 items total
Sloth Hole	FL	6	4 mastodon, >33 ivory points, +other sp.
Ventana Cave	AZ	1	Clovis and many species utilized
Totals: 4x sites	2x+N.S.		

* indicates site included here and in text but not in Appendices 1 and 2.

of distribution should be fairly accurate. The accuracy of population density viewed through point density is completely unknown, despite this assertation by Meltzer (2002:43; 2004:548). The important aspect to remember from sites such as Miami, Texas, with three Clovis points, one generic stone tool, and two Alibates flakes (found in 1990), is that from the depauperate artifact assemblage we would never suspect that five mammoths were killed there (Holliday et al. 1991:37). Further, this small number of artifacts would likely be misinterpreted as indicative of a single person wandering through the area and stopping for only a short while. What we know of intrasite spatial arrangement and activities represented by these patterns needs to be compared or contrasted with Eastern sites that have similar low-density artifact assemblages.

Early Paleoindian Mobility

Two broad aspects of Clovis mobility are considered here. First, the distance and bearing of parent source material and artifact find locations have a lot to tell us about movement and range use. Second, some broad aspects of larger-scale movements are considered, particularly as they relate to biological populations.

Clovis Mobility Evidence

The movement of toolstone from its source in the form of cores, finished tools or projectile points is our best direct evidence of Early Paleoindian mobility. The package form that is traveling should be discernable based on recovery of particular debitage classes or the lack of specific debitage classes. Core reduction debitage, bifacial thinning flakes, outré passé flakes often used as tools, and other more generic lithic waste, if present, should indicate what is traveling and where manufacturing activities are taking place. Several examples of exotic stone bifacial cores and finished projectile points are discussed here as they are most frequently singled out in the published literature and may indeed be the preferred package forms with which to travel. The distance from a stone source area to find locations is arbitrarily divided into three classes: local stone 0-40km, non-local stone 40-200km, exotic stone 200-1800km.

Points made from Knife River (Yellowstone) chert and black cherts from northern Minnesota's Iron Range are indicative of the clearest linear directionality among Clovis artifacts. The northern latitude American cherts and find locations have a unidirectional west to east migration of between 1800 to 1100 km until you get roughly to New York (Tankersley 2002). A Clovis point at the Lamb Site is believed to have been made from Knife River Flint from the Yellowstone area, 1700 km+ away (Gramly 1999).

These are the longest known distances traveled and are mostly in line below the last glacial maximum. Obsidian from central Mexico brought straight north about 1000 km into Texas is known from a few sites mentioned below (Collins et al. 2003). However, for the most part multiple exotic stone types occur at sites on the Plains and directionality is greatly obfuscated. Population aggregation and the possibility of stone exchange rather than travel of actual people is considered briefly at the end of this chapter.

Several examples of impressive linear distances of rock travel are intending to demonstrate that information, actual material, and likely individual people are regularly traversing distances that clearly make it possible to blanket the continent with thin, scattered sites in a short time without large populations.

An obsidian Clovis point from Kincaid Rock Shelter is from a source 1000 km away in Queretaro, Mexico (Hester et al. 1985, Hester 1988:28). A Clovis point from 41CL72, near Port Lavaca, Calhoun County, Texas was made from an unidentifiable obsidian most similar to material from Washoe County, Nevada (Hester 1988:28).

Six Clovis points of Hixton Quartzite from Silver Mound, Wisconsin, are reported from the Hale site (Vigo County, Indiana-700 km); the Kuester site (Gibson County, Indiana- 730 km); the Newburgh site cluster (Vanderburgh-Warrick County, Indiana- 780 km); the Rockport site cluster (Spencer County, Indiana- 800 km); the Sandy Springs site cluster (Adams County, Ohio- 900 km); and an unnamed site near the Historic Entrance of Mammoth Cave (Edmonson County, Kentucky- 900km) (Tankersley 1988:35). These Clovis points only represent the southern range of Hixton Quartzite, additional long distances are known to the east and possibly to the west (Tankersley 1988). In the revised fluted survey of Indiana Tankersley notes that 10% of all Paleoindian points were made from exotic materials (defined as >200 km from the source) (Tankersley 1990:48).

At Blackwater Draw an obsidian Clovis point (TMM937-862) was made from a source in the Jemez Mountains, 160 km to the northwest at Valles Caldera (Shelley 1984). Macroscopic look-a-like sources of Alibates (125 km northwest near Yeso, NM) and Edwards chert (144 km southwest) from Blackwater Draw may alter our view of directionality of movement of the people at Clovis (Shelley 1984). More recently it has been suggested that low-power microscopic identification of particular inclusions indicate the Blackwater Draw artifacts really are Alibates and Edwards Plateau cherts (Hester 1988; Johnson et al. 1985).

The materials utilized for flaked artifacts in the caches frequently come from south and east of the find spots. On the High Plains average distances between source and find spots appear to be on the order of 200 to 300 km. Eventually patterns of movement, whether stone alone or of human population, should be available for nearly all publicly held Clovis artifacts because of the ease of online data publication.

The evidence from toolstone procurement sources and discard locales will be our best direct information on mobility. A critical need is to determine distance and bearing as well as our data will allow. It is conceded that frequency of moves and distance per move are not discernable using these variables. However, there are reasons to be highly mobile: greater access to food or toolstone, and to congregate and share information, or re-enforce social relationships and gain access to mates. Some of these reasons are directly subsistence related but reproduction of the group must have been more important than the others.

Migration Mobility

Several issues regarding the initial colonization of the New World (whether by Clovis or others) are mirrored in the long distances covered by Clovis people as they occupied most of North America (Anderson 1996; Anderson and Gilliam 2000; Kelly and Todd 1988). There are several reasons to enter the New World initially. It maybe easier to make a living (perceived or actually is easier) in the new place if: there are no hunters to compete with other than carnivores; or the animals have no human flight response, which is quite likely; further, there was likely an increased density of fauna per square km south of the land bridge (Harris 1985; Martin and Klein 1984). Additional pressures to leave a home range may include population increase or social splintering (Kelly and Todd 1988). There are a finite number of possible reasons to emigrate. There are a finite number of places from which to emigrate. Making these seemingly facile statements explicit allows us to examine and eliminate those reasons that do not fit the known archaeological, biological, and linguistic data as questions of when, by who, and where the initial colonization of the New World are analyzed (Alroy 2001).

Clovis mobility operates at a larger scale than any later group. Cumberland, Folsom, Gainey, Goshen, Suwannee, and Simpson all have smaller geographic distributions and less exotic chert use (Dunbar 1991; Haynes 2002; Tankersley 2002; Tompkins 1993). The restricted range use, and post-extinction subsistence base changes, are fundamentally unlike Clovis even if the culturally produced technological adaptation retains similarities for the next millennia.

The direction of travel from source materials is probably more informative of prehistoric mobility than distance information alone. The majority of exotic lithic material frequently come from east or south of the find spot (Collins 1999; Ferring 2001; Tankersley 1988; 2002). This seems to be the case for finished Clovis points but no one has examined whether this holds true for any other class of artifacts. Beyond just examining Clovis points other stone artifact classes are likely to actually be more informative as we view exotic tool stone at the assemblage level. Exotic lithic manufacture stages: finished points, finished tools, bifacial or outré passé debitage mean smaller packages of material were transported than greater bulk forms of flake, shatter, cores and core fragments. The important question will be to determine if finished tools or bulk raw materials are being transported long distances.

One specific example is particularly telling regarding home range, colonization and resource utilization. The stone materials present at Aubrey, Texas come from seven different locales.

Chert types present at Aubrey:
Alibates 490km west/northwest
Tecovas at Quitaque 380 km west/northwest
Edwards from Callahan 250km west/southwest
Fredericksburg 475 southwest
Catahoula Formation (Tecovas and Edwards look-alikes) 315km south/southeast
Novaculite from Western Quachitas (unconfirmed) 155km east/northeast
Novaculite from Hot Springs 400 north/northeast
(Ferring 2001:224 Table 10.6) The directional variation of source material is critically important to our understanding of Clovis mobility. If Aubrey is truly the earliest Clovis site then the multidirectional source areas become of even greater import: namely, we should expect to find even older Clovis sites as the people from Aubrey had already been north, south, east, and west of this location prior to stopping there. The evidence from the oldest Clovis site indicates Clovis people had actively searched more than 200,000 square km of the Southern Plains before they become visible in the archaeological record at Aubrey (Ferring 2001). Specific examination of chert types by artifact forms represented is included in Ferring's analysis (Ferring 2001). Artifact classes to consider include finished points, point performs, other tools, bifacial cores/blanks, cores, and varieties of flake debitage. If this type of geographic coverage and artifact tool material sorting are combined for several Clovis sites we might recognize patterns of directional movement, preferential selection for specific artifacts or tasks, and possibly interactions between groups.

Clovis group (or individual) mobility is averaged by accumulations at sites and repeated activities if a site is reoccupied. Numerous directions can be represented rather than unidirectional travel. This may be a groups effective home range or may represent specific utilization and distribution of preferred stone types. However, a critical observation, often made by others regarding regional distributions, is that almost always we see that colonizing Clovis people have already been south and east of where we find their cultural remains (Anderson 1996; Collins 1999; Frison 1981; Tankersley 2002). No matter how old the sites are these people clearly had to have been in the country for some time prior to depositing artifacts at Blackwater Draw, Aubrey, and nearly every other Early Paleoindian site (Hester 1972; Ferring 2001; Meltzer 1993a; 1993b). The oldest Clovis site, Aubrey, TX at roughly 11,565 uncalibrated radiocarbon years ago (an average of 11,540+/-110 (AA-5271) and 11,590 +/-90 (AA-5274); Ferring 2001:50), may be the exception that proves the rule: the Clovis point found there is made from nonlocal gray chalcedony (cemented Tecovas quartzite) (Ferring 1989:10) found north and west of the site. All of the material was exotic: 155 to 490 km away for 9,818 of 9,819 flaked stone artifacts (Ferring 2001:154).

Plotting distance and bearing of exotic tool stone occurrences, particularly when complete points, other tool forms, and debitage classes are differentiated, might actually indicate corridors of movement. Mountains, and other geographic obstacles to movement might help show these accurately in the Western United States.

The Myth of the Isolated Occurrence

The notion of an "isolated occurrence" is an antiquated concept that undermines the legitimacy of the practice of archaeology and in many situations tacitly or directly legitimizes looting of sites, such as occurs in Florida under the Isolated Finds Policy that is widely ignored. Simply put, every single artifact contains data from a number of different classes. Human made artifacts do not occur in a vacuum. Even when an item is, rarely, totally isolated from every other artifact it still contains information regarding: material properties such as distance and bearing from the source, morphological properties, technological properties, the location of the find, and the context of the find.

While working on the Tennessee point survey Broster and Norton found that numerous "isolated occurrences" had produced multiple fluted points serially to different individuals and were then recorded as sites (Broster and Norton 1996:296). A total of 29 sites and 63 locales produced 654 documented Clovis points. They cited the state's concentration of points and sites as real evidence directly contradicting Meltzer's Eastern Paleoindian settlement model which emphasizes the apparent overabundance of isolated occurrences as evidence of a highly mobile generalized foraging adaptation on a landscape believed devoid of traditional concentrated archaeological sites (Broster and Norton 1996:296; Meltzer 1989; 1993b).

Old and New Clovis

There is a developing hypothesis among Paleoindian lithic analysts that Clovis points may exhibit a time-transgressive evolution in reduction strategy and morphological form, as mentioned briefly in the point section of Chapter 4. "Old Clovis" is essentially wedge or V shaped at the bottom: the faces at the base are expanding away from each other for some distance up the body of the point. In cross section "Old Clovis" will be lenticular according to Tony Baker (2000). An alternative division of "Old Clovis" forms is proposed here: Co-occurring excurvate sided or waisted Clovis and parallel sided lenticular cross section Clovis (Classic Clovis) are the main forms of recognized early Clovis points. The excurvate Clovis form is typically plano-convex to rectangular in cross section, atypical excurvate specimens can be lenticular in cross section. The most important manufacturing distinction between the parallel and excurvate sided Clovis points is the very high percentage of excurvate Clovis with a late-stage outré passé flake removed from one margin that makes the widest part of the point (above the haft grinding) the thinnest part of the point. Three Floridian excurvate sided Clovis points are shown in Figure 5:4 that show the late lateral thinning flake above the large flute on one face.

Table 5:4 includes the currently known occurrences of excurvate Clovis points. This aspect of the research is in its infancy and will certainly grow quickly from this beginning. The distribution pattern of excurvate-sided Clovis points seems to indicate a band across the southern portion of the United States.

"New or Late Clovis" points have parallel faces from the bottom of the base up the body of the point, in much the same fashion as a Folsom point. Baker describes the parallel faces as a result of increased reliance on the dome and planning reduction method rather than the patterned usage of outré passé thinning seen on "Old Clovis" in my view (Baker 2000). Parallel faced Folsom points exemplify the parallel faces as tentatively defined for "Late Clovis."

It is suspected that there is greater continuity between "Late Clovis" and Folsom than may initially be apparent if the broad variation in Clovis is simply taken together. Tony Baker, Michael Johnson, James Dunbar, David Thulman, this author, and several

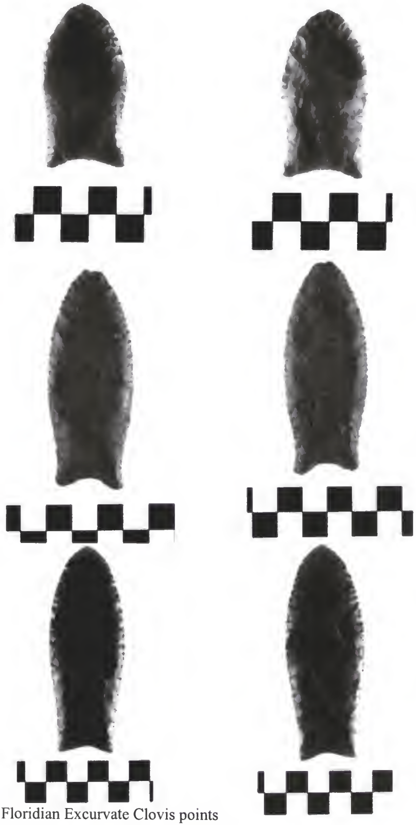

Figure 5:4 Floridian Excurvate Clovis points

Table 5:4 Excurvate or "Waisted" Clovis point occurrences.

Site	State	Waisted #	Other form #'s	Comments
Adams	KY	3	2?	More failed
Big Bone Lick	KY	2 maybe 3	4 or 3	Broken in flute crp4:37 pic C6
Blackwater Draw	NM			
Dallas	TX	1		Sand pit
Gault	TX	1	35?	W/engraved stones crp8:14
	LA	5+		1930's and 1950's finds
	SC	1+		
Mosquito Point	NY	1		Cayuga Co. Ritchie Book
Mason Co.	KY	1		Ebay #
McFaddin Beach	TX	5+	65 total	
Murray Springs	AZ	1	19+ parallel	
Sloth Hole	FL	5, 1 mia	1 parallel	
Totem Shoal	FL	1+?		
11 identified	8			

others have been involved in discussions that will lead to more formal research reports on this specific issue (Baker 2000). The co-occurrence of osseous tools and excurvate-sided Clovis points at Blackwater Draw, Gault, McFaddin Beach, Murray Springs, Sloth Hole, and Totem Shoal seems to indicate that these may indeed be the older, pre-extinction Clovis point form.

Individual collections of major Clovis sites will have to be examined and dated localities sorted as initial steps in this project. Clearly immediately after Clovis times there is a strong tendency to make parallel faced fluted points (Goshen, Folsom, Gainey, maybe others). There is another well documented trend towards thinner points after Clovis times that is likely directly related to the production of more razor-like projectiles (*sensu* Tankersley 1994). The possibility of seriating Clovis points based on the reduction sequence trajectory and basal morphology would be of immense value for tracing technological change within the 800+ year Clovis period. Presently Baker considers Fenn, Blackwater Draw and Debert to be examples of Old Clovis. The Little River Clovis Cluster sites of Kentucky. Specifically, Adams (15CH90), Boyd (Ledford

15CH236), Ezell (15CH483), and Roeder (15CH482); and Big Eddy, Missouri are considered to be examples of "New" Clovis (Baker 2000; Ray et al. 1998; 2000). The Little River sites are all related to quarrying activities of local Hopkinsville chert (Smith and Freeman 1991).

Baker (2000) asserts that "New Clovis" independently invented Clovis Blade production and that "Old" Clovis point makers did not produce blades. The reputed "New" Clovis sites frequently contain blades but so do a great many "Old" Clovis localities as can clearly be seen in Table 4:1, earlier in this work. It is worth documenting whether there is any patterning of the occurrences of blades with "Old Clovis" or "New Clovis" if either seems to appear more frequently.

By combining mobility data derived from discoveries of Clovis points made using exotic toolstone (>200km from source), excurvate-sided Clovis points sorted within their overall distribution by local or exotic toolstone; reliably dated Clovis points sorted by form; and the pilot technological point seriation presented above, the idea that excurvate-sided Clovis is the pattern initially found at Clovis sites across North America becomes a testable hypothesis.

I suggest excurvate-sided Clovis points are predominately manufactured from local toolstone and only rarely made from exotic toolstone. This indicates a pattern for excurvate-sided Clovis points arrives with the initial colonization of a given area. Regionalization that is clearly observed after Clovis in Folsom, Gainey, Suwannee-Simpson, and other Middle or Late Paleoindian projectile forms, has its beginnings in Clovis times. The intra-Clovis point variation occurs prior to the Pleistocene extinction and Clovis drought. Intra-Clovis variation likely has its basis in isolations of a once united social group.

Mobility data derived from exotic versus local toolstone and the radiocarbon record may show that exactly the opposite trend occurred. That is, parallel-sided Clovis points made from exotic material arrived first at any given spot colonized by Clovis people. It should be noted that our suite of radiocarbon dates from early sites is *not* adequate to address this issue at present. Hundred of directly dated Clovis artifacts and directly utilized animal carcasses will have to be dated first (*sensu* Stafford 1988).

Stable isotope geochemical analysis of tusk remains, particularly ivory artifacts, may potentially aid our understanding of Clovis mobility as well. Geographically specific bedrock strontium signatures should be discernable in ivory artifacts if they are well enough preserved (Hoppe et al. 1999; Koch et al 1998). A large number of Florida ivory tools have been sampled for this purpose and await future analysis. Here is another example of a potential pitfall induced by individual animal behavior that is entirely masked in the archaeological record. As discussed in the osseous tool chapter, most known ivory tools came from mastodons, based entirely on the oversized Florida sample. It is now thought that mastodons from north Florida migrated off of the Gulf Coastal limestone plain and unto the granitic piedmont area around Atlanta during the drier winter months in search of water and browse (Hoppe et al. 1999). If Floridian ivory tools with a north Georgia strontium signature were found they would not necessarily reflect human procurement of ivory in Georgia. Strontium isotope research would be likely to document long distance travel of an item beyond the 200 to 300 km range of mastodons. In Florida, this would be especially important to prove because most Early Paleoindians seem to have used local chert that tells us little about distance and direction of travel. If an ivory tool was identified from a distance greater than those inferred for mastodon travel a cultural explanation for its discovery site could more logically be invoked. The strontium research results are tentative but hopefully can applied to archaeological questions in the future.

Clovis Aggregation Behavior

Mockingbird Gap, New Mexico may be the largest Clovis aggregation site yet discovered and the only one recognized as such; although Gault, Carson-Conn-Short and other quarries may also be aggragation sites. A total of 182 complete Clovis points, 66 tips and 80 preforms made of material from every direction (Chuska, Edwards, Alibates?, and others) were found in one place, and it is not a quarry (Weber 1997, Weber and Agogino 1997). This is similar to the situation at Lindenmeier where quantities of material form every direction occur together (Wilmsen and Roberts 1984). Complete publication of this site is critically needed (see Weber 1997 and Weber and Agogino 1997).

Because quarries do not often have discards of multiple exotic material types even if population are meeting there, we may not be able to demonstrate it from the data we are able to recover. Yellow Hawk, Taylor County, Texas is a Clovis quarry worth examining for potential aggregation data based on exotic stone artifact discard (Mallouf 1989). The Adams and Little River sites present a similar quarry cluster worth searching for exotic materials (Sanders 1990). A telling, but isolated. occurrence at the Gault Site, Texas, is known. Gault, an Edwards Plateau chert quarry has one exhausted Clovis point made of Alibates chert from 520km to the northwest (Collins et al 2003).

Co-occurrence of the excurvate-sided and parallel-sided Clovis points more frequently at quarry, or near quarry sites, may be evidence of congregation at these sites particularly if they co-occur less frequently at other types of sites, such a kills and small habitation or special use areas. Examination of Clovis aggregation behavior will be embedded in other forms of research, particularly information on exotic material types at large kill, habitation and quarry sites.

Summary

The specific aspects of land use behavior and Early Paleoindian movement addressed in this chapter demonstrate short-term use of many sites with minimal repeated occupations by Clovis people. Limited use of unique landscape features, such as caves, is even predicted by the Paleoindian model developed by Kelly and Todd (1988). The multidirectional sources of utilized stone regularly hauled tremendous distances and the continued production of a unified stone and bone toolkit across these spaces indicates adaptational solidarity within a single cultural unit. Evidence of caching behavior and artistic representations recapitulate long term planning strategies that are also seen in the repeated curation of stone tools, and occasionally, some of the osseous tools presented in Chapter 3.

Early Paleoindians created a technological adaptation suited to the needs of life on the Terminal Pleistocene landscape of North America. In the case of Clovis, this meant lots of highly curated and portable, hunting and subsistence tools. This technological readiness allowed them to move from resource to resource without the need of redesigning tools (*sensu* Kelly and Todd 1988). Whether the exploited resource was a quarry or a killsite, Early Paleoindian Clovis people used what they could of a resource and moved on. It is possible that the Old and New Clovis sub-traditions represent the beginning of geographically, and resource restricted cultures that we see immediately after Clovis in Folsom and other Paleoindian cultures (Wilmsen and Roberts 1984).

CHAPTER 6
CONCLUSIONS AND RECOMMENDATIONS FOR FUTURE WORK

E Pluribus Unum - One out of many

It has now been 70 years since the initial Clovis discoveries at Dent and Blackwater Draw (Figgins 1933; Howard 1935). This literature is spread over a considerable amount of time and space. Clovis culture only existed for a few hundred years, but managed to produce a thin signature across a very large geographic area. The actual range of material culture and patterned behavior discernible from the archaeological record has a tremendous breadth across the landscape. Local, and even regional, examination of Clovis material will always fail to adequately describe the full range of this culture. Further, in examination of only a limited section of Clovis material culture, rare items make regional differences appear genuine and distinct. If Clovis is considered across its entire range of distribution, it becomes quite clear that very little of their behavior was truly unique.

Imagine, for a moment, the five blind men describing the essence of an elephant from only the portion they are able to touch themselves: one has the trunk, one a tusk, one a leg, an ear, and the tail. Each person is correct in their specific local description, yet each region only contains part of the whole. Therefore, generalizations about the whole will always be inadequate. The full range of known Early Paleoindian subsistence, technological, and behavioral patterns can only be derived from amassing the real data in one place. Clovis was a highly mobile culture with lower population density per unit area than anything that came after it.

Kelly and Todd (1988:239) characterize the wide-ranging movement of Paleoindians as part of a "high technology forager system" that was not place centered. Rather, in their model, Paleoindians were expected to be technology centered, an adaptation that would facilitate long distance movement and reliance on knowledge of animal behavior for subsistence (Kelly and Todd 1988). Unfortunately, they fail to discuss the importance of the predictable location of large animals because of their behavior, which creates widespread networks of game trails (*sensu* Haynes 1985). This means little animals are hard to locate predictably but large animals are not difficult to locate. A final prediction of their model is that Paleoindian kill sites should exhibit minimal processing of individual animal carcasses, particularly when compared to Late Prehistoric groups who utilized nearly every portion of large animals (Kelly and Todd 1988:238).

The known aspects of the Early Paleoindian subsistence base, osseous and stone technology, and movement upon the landscape described here largely verify the predictions of the Kelly and Todd model (1988:239). The continent-wide similarity in process and forms represented in the toolkit are the best understood part of Clovis culture and substantiate the most important assertion that fluted point assemblages should be consistent across different environments (Kelly and Todd 1988:231; Meltzer 1993). The preferred use of highly quality crypto-crystalline stone and widespread usage of bifaces (and more importantly bifacial cores) are clearly hallmarks of the Clovis adaptation, as they predict (Collins 1999; Frison and Bradley 1999; Goodyear 1979; Kelly and Todd

1988). Even the expected, limited amount of processing and butchery evidence per animal killed by Early Paleoindians is shown to be real for many of the taxa discussed in Chapter 2 (Kelly and Todd 1988; Haynes 2002).

The final prediction of the Kelly and Todd (1988:231) model is "the apparently rapid occupation of the New World". If exotic stone is indeed acquired through direct procurement, then it is possible that home ranges and linear migrations of individual Early Paleoindians covered thousands of kilometers, even outdistancing the proboscideans (Collins 1999; Collins et al. 2003; Ferring 2001; Haynes 1995; Hoppe et al. 1999; Kelly and Todd 1988; Tankersley 2002).

Future Work

A project of this nature is never complete. The intention has been simply to build a framework, unto which, more details and new discoveries can continually be added. Additional subsistence data can be generated simply by mining existing museum collections. The most pressing need is to examine individual bones from each site for proper identification (taxon, element, MNI), and then look for modifications by humans. Several sites and collections that would benefit from these endeavors have been mentioned throughout the text. The direct evidence of utilization for 116 taxa is impressive but can only be a portion of those resources actually exploited.

The tendency to polarize evidence in the argument on overkill has led to an all-or-nothing ideology regarding the Clovis subsistence adaptation (Grayson and Meltzer 2003; Meltzer 2004). In determining what is and what is not Clovis, the extinction event is a sideshow. Direct dating of individual animal bones, especially those fashioned into formal tools, can help resolve questions of human interaction levels and the timing of those interactions. Furthermore, as additional carnivores are directly dated the arrival of multiple predators at the end of the Pleistocene can help understand another potential influence in the extinction event (Harris 1985).

Certainly there is only limited direct utilization evidence for many of the species presented in Chapter 2. However, even the moderate amounts of evidence for the utilization of a handful of plants and animals such as hackberries, invertebrates, tortoises, some bears, deer, *Palaeolama*, and tapir are beginning to show patterns in the resources exploited by Early Paleoindians across the continent. There is even more solid evidence for the widespread, repeated utilization of bison, horse, mammoth, and mastodon. Meltzer (1993c) is correct in saying that we find the large animals because they are large and have a better chance of being discovered by researchers. That is exactly the reason these animals were killed by Early Paleoindians during the Pleistocene.

It is important to keep in mind that none of the empirical evidence is insignificant. The clear utilization of blackberry one time in one place (Shawnee-Minisink) is still direct evidence that expands our view of Clovis diet breadth and the specific resources exploited (McNett 1985). It should be re-iterated that the single known occurrence of utilizing a resource is not thought to be idiosyncratic usage but rather simply, the only example found thus far. This can easily be seen in the bone and ivory tool assemblage as very few forms are unique manifestations of Clovis behavior or activities.

A considerable geological problem for archaeologists is site visibility. Our site detection methodology is simply inadequate to detect sites considering the geologic site formation processes of some areas. The depth below ground surface of Aubrey is the clearest demonstration of the shortcomings of modern site survey methods (Ferring 2001). There are probably 1000 Clovis sites of which, maybe a quarter, have any organic preservation. Each individual discovery becomes important for the new data it adds and its ability to contribute towards a holistic interpretation of Clovis as a cultural entity and not just a type of projectile point.

Conclusions

The Clovis footprint on the landscape is light. Diet, caching and burial behavior, toolstone acquisition, bone and stone tool manufacture processes and completed forms, mobility, site size and distribution exhibit patterns visible only when multiple sites are examined from all areas of Clovis occupation.

Several overarching statements drawn from the assembled data suggest that Clovis culture may indeed be a unique combination of technological and subsistence adaptation attributes (Kelly and Todd 1988:239). Clovis people had the state of the art hunting technology on the planet at 11,500 rcybp. Clovis material culture has no directly recognizable cultural antecedent, much like Anasazi Basket Maker II in the Southwest (Haynes 1982; Meltzer 1993a). Slow, clear, mono-phyletic gradualism is expected yet punctuated equilibrium, or non-directional innovation, is what we observe in the archaeological record.

Clovis culture has the largest geographic distribution of any group in the prehistory of the New World: extending from Alaska to Panama and from Tampa Bay, Florida to Debert, Nova Scotia (Meltzer 2004; Pearson 2002; Stanford 1991).

It would be an overstatement of the facts to say the big game hunting evidence indicates dependence, or even reliance, on proboscideans for dietary calories. However, the cultural aspects of elephant hunting continent-wide include a demonstration of extraordinary technological virtuosity in the stone, bone and ivory tools made for the subsistence needs of Clovis people (*sensu* Fitting et al. 1966). The Terminal Pleistocene extinction event not only reduces the available Clovis diet, it also removes *the* important source of material for making many of their tools and other material culture. The lifestyle of people who use mammoth and mastodon bones to kill mammoth and mastodons (among several other things) will be fundamentally altered when those resources disappear. Clovis can no longer be Clovis after the Pleistocene extinction event.

Their specific combination of technological and subsistence adaptations made it possible for Clovis people to have the broadest diet breadth of any hunter-gatherer group in the prehistory of North America. The issue that seems to cause much of the confusion regarding what should be considered Clovis is that we rarely identify an extreme end in the normal range of human adaptations. Clovis, quite likely is just that, one end of the spectrum of human cultures in the prehistory of the New World. Not only in a chronological sense but perhaps more importantly, in an adaptational sense.

KEY TO APPENDICES 1 AND 2

Site Data Base discussion and comments on key to entries.

Counties: No counties in Alaska. Mexico and Canada used to cluster those countries in computer sorts.

Tools: formal bone or ivory tools known to have been recovered at this locality.

Unequivocal Fauna X means based on context and/or modification this animal was definitely utilized. X? means there is a very high likelihood this animal was utilized.

Culture:
C= Clovis, followed by the number of points found, if known.
Cx= Clovis, with points recovered but number unknown.
Ixc= Ivory tool considered Clovis, exact number unknown, usually will have a number.
Bxc= Bone tool considered Clovis if made from identifiable extinct animal element.
F= Folsom
G= Goshen
Gyp= Gypsum
ScB= Scottsbluff
Si= Simpson
Su= Suwannee
Unf= Unfluted lanceolate variety

APPENDIX 1 SITE LIST

Site Name	County	State	Tools	Unequivocal Fauna	Culture
12 Mile Creek 14L01	Logan	KS		X B.a.12 cuts/assoc	C1 resharp
A FL RIVER hemmings?	Hillsborough	FL	tool/cut?	X M.c. vert spine	none
Agate Basin A3 brewst	Niobrara	WY		below Folsom	none
Agate Basin Folsom A2	Niobrara	WY	bone3?	Platygonus c. mand	Folsom
Alexon Bison Kill Site	Jefferson	FL		X Bison a. 2+? 1X	C/Si/S frag
Angus	Nuckolls	NE	Fig1931	X Mam 300k?p/scap	C1,cobble
Anzick Burial Cache	Park	MT	b11,6?	X mam1+? 70bif Hs	C8,b11-6?
Arroyo Chinabampo	Mexico	Sonora		any bones?	Cx
Arvilla	Grand Forks	ND	ivory	X prob Jenks 35	Ic?
Aubrey	Denton	TX		X gator? Crp6	C2 tips
Aucilla 1/4 Mile Rise	Jefferson	FL	ivory	X mast>mam BenW	i1c
Aucilla 1A	Jefferson	FL		X? Neo pink spiral	?
Aucilla Below 98 Bridge	Jefferson	FL	ivory	X mast>mam	i2c
Aucilla General collect	Jefferson	FL	ivory	X Ma>Mc E Moore	i7c
Aucilla W.R.above 98	Jefferson	FL	ivory	X Ma>Mc Mk Hutto	i1 haft
Austin Cave (40RB82)	Robertson	TN		X? hickory nuts faun	C2+16 pref
Baja	Mexico	Baja		Eq/Cam/B split/char	none
Bee Co Buckner Ranch	Bee	TX		Mc,Ma,Eq,Ba,Gly	C1base,f/m1
Beeville	Bee	TX		Equus x?	?
Bent Palm (Aucilla)	Jefferson	FL	I1?	X? 1 cut bison	C1+? I1+?
Bigbee Site	Torrance	NM		X? mam Haynes54	C3, 1unf,1ob
Big Bone Lick	Boone	KY		10.6+/-250(w-1358)	C6, 1898
Big Eddy	Cedar	MO		Unlisted fauna	C4 frags
Blackhole Cave Auc3A	Jefferson	FL	i1	X probo	I1c, Bicore
Blacktail Cave 24LC151	Lewis&Clark	MT		4sp 7flake+other sp	Gosh 1 or 2
Blackwater Draw No. 1	Roosevelt	NM	I2,B4	X M.c.15? 4 cl B.a.7	C13,i1,b2
Blue Springs Hole	Gilchrist	FL		X? magnum stabs	?
Boaz	Richland	WI		mastodon 1897	C1
Bonfire Shelter	Val Verde	TX		1 mammoth	C1? pre-F
Borax Lake LAK-36	Lake	CA		bones uid/stat??	C21, 5 buried
Bridgeport	Morrill	NE		Ba and Castor O	artifacts
Broken Mammoth	no counties	AK	I1.2i?	X Mc 11-11.8	i3, b2 mblade
Bull Brook	Bull Brook	MA		X? caribou beaver	C~x
Burnet Cave	Eddy	NM	bone?	X horse 5thMT tools?	C1, b?
Burning Tree F91		OH		X? cuts 11.660-450	none
Butler Site 8GI1 suwan	Gilchrist	FL	B2	X prob disk,Ma pat	b2c
Campbell Farm	Canada	Ontario		11.2-500 11.4-450	
Carter-Kerr McGee	Campbell	WY		X?McCamGBaMul/F	G>c3
Casper Site	Natrona	WY		X?Camelops 11,190	C1, Hell Gap
Charlie Lake Cave	Canada	Brit Colum		X? but age?	Cx+ AA99/88
Chesrow I?	Kenosha	WI		X? mammoth	Chesrow
China Lake	Kern	CA	iv shem	ex fauna faught527	C9?,1i?

Claypool 5WN18	Washington	CO		any????	C?x
Coats-Hines 40WM31	Williamson	TN		X? Ma cut+ other sp	34 no diag
Colby	Washakie	WY	bone?	X 7Mc+fetal,camrad	C4, b1
Conkling Cave(m) Bcap	Dona Ana	NM		Eq/camelops/Noth	none
Crook County Cache	Crook	WY	B3	X prob 2 30/1.5cm	C1,b3 8bif
Cypress Hole	Jefferson	FL	I and B	X Ma>Mc	C+I, Si, Su
Darby Springs	Alachua	FL		Pl. fauna	Su?
Debert (Colchester)	Canada	Nova Scot		X caribou on points	C25 or 6
Delong	Washoe	NV		X? Mc3 cv+7sur fam	Cx? Stem?
Dent	Weld	CO		X 15 M.c.	C3 11.2k
Dietz 35LK1529	Lake	OR		X sinew blood pollen	C60+25pref
Domebo CD50	Caddo	OK		X 1 Mc 3 Edw ch,Gc	C5 3tip dam 2surface
Drake Cache 5LO24	Logan	CO	Iv tool?	X probo? Bi-bev	C13, i1+?
Dry Creek Cave?	no counties	AK		bones?NO BONES?	fluted triang
Dutchess Quarry Cv1	Orange	NY		caribou?	Cum1?
Dutchess Quarry Cv8	Orange	NY		caribou bird fish 3c?	2 S3/1S5flut
Dutton (Selby NO!)	Yuma	CO		M. c. 1+?	C1
East Wenatchee Cache	Douglas	WA	bone 14	X Mc?HsBaOvRabS	C14,B16,9bl
Edisto Beach/colleton	Charleston	SC		X? probo rib cut	none
El Bajio	Mexico	Sonora		Any fauna?	C8+
El Llano Fiedel 87		TX		Mam. Sp. p68	C6-8?
Escapule	Cochise	AZ		X M.c.1 runnoft	C2
Etna Cave	Lincoln	NV	b.bead	Eq/camel/sloth	lanceolate
F96 Farview	Livingston	NY	MI?	Ma Cerv scot weak	none
F99 Alma	Gratiot	MI		M.a.1 ad female	none
F99 Burning Tree	Licking	OH		X?M.a.1ad m cuts?	none
F99 Fairview	Osconda	MI		M.a. 1 y ad male	none
F99 Grandville	Kent	MI		M.a. 1 ad male	none
F99 Owosso	Shiawassee	MI		M.a. 1ad female	none
F99 Parker	Eaton	MI		M.a. 1 ad male	none
F99 Powers	Menominee	MI		M.a. 1 ad female	none
F99 Shealthelm	Ingham	MI		M.a. 1 y ad female	none
F99 Shelton	Oakland	MI		M.a. 1 adol female	none
F99 Warren	Ulster	NY		X? M.a.1 ulna 2cuts	none
F9x Rappuhn	Lapeer	MI		X? M.a. 1 cut burn	pole plat?
Fairbanks-nearby	no counties	AK		X Mc yuman in skull	Yuman1
Fishbone Cave Level 3	Pershing	NV	bone?	X? eq cm-sp burn	none
Fishbone Cave Level 4	Pershing	NV	bone?	X? eq awls cam s/b	11.1basket
Fossil Hole 8JE1497	Jefferson	FL		X T.v.1+ Ma>Mc	C? ix?
Fossil Hole= Ward #1?	Jefferson	FL	ivory 4+	X Ma>Mc, Grissott	C3,i4,Su1
Fowler Bridge Mastodon	Hillsborough	FL		X M.a. Geoche.	lanceolate
Gault 41BL323	Bell	TX	bone 1	X M.? Engraved lime	C36,b1
Gerrell Site 8je639	Jefferson	FL	ivory 1?	X foreshaft frag.	i1c
Glory Hole 8JE1556/287	Jefferson	FL	ivory	X mast>mam 1+?	i1c barb
Goldstream/Tanana V.	no counties	AK	bone 2	X probo rods ab,bwd	b2, 3lance
Grenfel	Canada	Saskatch	bone 1	X probo? Point or?	Unknown
Guest Mammoth Kill	Marion	FL	ivory 6	X M.sp.	Cx?, i6
Harney Gap Bison Site	Hillsborough	FL		B. sp. brwn hardpan	Sux
Hebior 47KN265	Kenosha	WI		X? Mc 12.5k lithics	none
Heisler (clastic anchors)	Calhoun	MI	nsrl282	no X 1 Ma11770/100	none

Hell Gap 48GO305	Goshen	WY		11.4 k Loc. II	Goshen 1+
Hendrix Collection	Marion other	FL	I1, b3	X Ma, Pallama, Ov	C4Si21Su102
Hidden Cave	Churchill	NV		UCberk51 FAUNA?	
Hillsborough R +Fowler	Hillsborough	FL	bone 2	X spine beamers	b2c
Hinrichs 48co1401	Converse	WY		Mammoth	C?
Hiscock	Genessee	NY	NO!	X? M.a. 9+ (+/-80)	C/Gain7?
Holcombe Beach	Macomb	MI		X caribou on points	G? not C?
Horn Rock Shelter 2	Bosque	TX		St1-5A Clovis-Unflut	Su1=C1?
Hornsby Springs	Alachua	FL			C? Su4
Howard Gully 34GR121	Greer	OK		B.sp. burned G.c.	F1surface
Huntington Canyon	San Pete	UT	Ghayn	X? M.c.1m cuts/lith	Unf, pryor
Ich. 8SU5	Suwannee	FL	ivory 1	X 4 mend=1	i1c
Ich. Bison Landing A Ia	Suwannee	FL	ivory 1	X M.a. vest tusk?	i1c, Si1
Ich. DOT Landing A VIII	Suwannee	FL	I 1sq	X Ma>Mc @pwrline	i1c,Si1,Su2
Ich. Little Spring Run	Columbia	FL		X? cut bone/antler	Cx, I?
Ichetucknee R. Garcia?	Suwannee	FL	8505?	X Eq. Sp. Ilium cut	none
Ichetucknee River A III	Suwannee	FL	ivory 3	X Ma>Mc	i3c
Ichetucknee River A IV	Suwannee	FL	ivory 2	X ma? Scrpr/vert	i2c,Si2,Su4
Ichetucknee Simpson C	Suwannee	FL	ivory 5	X Ma>Mc 102603#s	i5c
Ichetucknee Springs	Suwannee	FL	ivory	X mast>mam 1+?	i1c,Cx?
Indian Creek 24BW626	Broadwater	MT	Folsom?	X Ba marmot+more	C1,10.980/110
Island 35 Mastodon	Tipton	TN		X? w/pelvis	Fluted Tip?vsStemmed
Island Hole	Jefferson	FL		fauna?	C1, knife
Isreal River Complex	Coos	NH		X waterlily seed char	C2iv,
Itasca Bison 21CE0001	Clearwater	MN		X? HELP shay 71	C1? It knife
Jacob's Cavern	McDonald	MO	B1 pic	X Ov l hum Ma pic	None,B
Jake Bluff	Harper	OK		X B. a. mni 15	C2 alibates
Johnson Site 40DV400	Davidson	TN		X uid bone feat C1	C3pref+Cu1 11.7/980
Kaufmann Cave48sh301	Sheriden	WY		X?Mc rad Hburn	Goshen 1
Kimmswick	Jefferson	MO		X Ma2,Slx?Bax?	C4 1fldmus
Kincaid Rock Shelter	Uvalde	TX		camel Zone 4	C4+pref
Klamath Lake Lower	Siskyou	CA	bone 11	bev.man ab,eq,ch,M	stem in eye
Klamath Lake Upper	Siskyou	CA		probo others?	fluted?
Klein II CRP8:117	Weld	CO		mam,eq surface	Cx
Lac du Bonnet	Canada	Manitoba	bone	probo fibula 17"	b1c
Lange/Furguson	Shannon	SD	bone no	X M.c. 2, Ba +many	C3b?top>
Latvis/Simpson 8je1500	Jefferson	FL	ivory	X mast>mam 1+?	i1c, Si1
Lehner Ranch	Cochise	AZ	splt bne	X 9im M.c.13 1 burn	C13 1insit
Leikum	Cochise	AZ		X M.fl? 2 1L mend?	C1
Leonard Rockshelter	Pershing	NV		11,199(570)heizer 51	bottom date
Leon Creek 41BX52	Bexar	TX		X? Ba Folsom mix?	Cx?
Levi Rockshelter	Travis	TX		Same?	C3+/lance
Lewisville	Denton	TX	2bone?	X rep eggs, hackber	C1, 22 Hrth
Lime Creek	Frontier	NE		Giant Beaver	Plainview
Lime Ridge 42sa16857	San Juan	UT	Ghayn	crp3 no fauna	C2 base+2tip
Lindenmeier Gyp/Fol	Larimer	CO		not x camel	Folsom/b
Lindsay 24BW501	Broadwater	MT		X? M.c. cut stack	none
Little Box Elder Cave	Converse	WY	bone?	weak site X?60sp.	none
Little River Rapids8je603	Jefferson	FL	ivory 3	X mast>mam w/L.R.	i2c +
Little Salt Spring	Sarasota	FL		X? G.c? 9645/160	2 wood pins

Lovewell Cave	Churchill?	NV	Not KS	S and J1988	?
Lubbock Lake	Lubbock	TX		X Mc3 C4.8/2.5/.56	C1edwds
Lucas	Kenosha	WI		X? mam burn bn	Chesrow
Lucy Herbour56 El Pal	Torrence	NM	not old!	X? M.c.leg not x B.a.	C2, San8
Malakoff	Henderson	TX		fauna? Sel52	?
Mammoth Meadow I	SW BkCan	MT		Msp Ba Hair Site	Uid bola?
Mandalay 8je1539/ta147	Jefferson	FL	I4,b2	X 2Eq 206853/54ma	C1,Si1,Su2
Manis mast 45CA218	Clallam	WA	bone	X M.a.2 bp in rib	b1c, C?
Manzano Cave	Torrence	NM	bola	Ch/sl J57 w57:160	San Gyp/yoch
Martins Creek	Holmes	OH		X? Ma Ov blood/fl	5fl 1uniface
Mathen-Childers 8je604	Jefferson	FL	ivory 2	X M.a. embed i pnt	C1, i2c
May's Point (Aucilla)	Jefferson	FL	ivory 1	X Ma>Mc 8JE1503	i1c
McFaddin Beach	Jefferson	TX	ivory? 1	X prob. +more spec	C65+, i1c+
McLean	Taylor	TX		X M.c.1 jaw others?	C1?, 1 flake
Mesa	no counties	AK			Mesa?
Miami (Cowan) 41RB1	Roberts	TX		X M.c.5 M.fl?	C3
Midland	Midland	TX		X? Eq femur, redep?	MIDLAND
Mill Iron	Carter	MT	bone?	B.a.? M. 2 rib tool?	Goshen31
Mockingbird Gap	Socorro	NM		k&a80 +80preforms	C182/66tip
Murphey: Lake of Pines	Marion	TX		X? mastodon gone!	C1 Story90
Murray Springs	Cochise	AZ	bone	X M.c.4, B.a.12/11	C20. B1
Naco	Cochise	AZ		X M.c.1 runnoft	C8, bx???
Navarette	Cochise	AZ	bone	X M.c.?	Cx, b1
Norden	Gilchrist	FL	bone	?	C? bx?, Sux
Nuckolls	Humphreys	TN		ANY?	C13, Cm6, R1
Omaha Aughey 1876	Douglas	NE		X? prob lum vert/pnt	point
Page-Ladson 8je591	Jefferson	FL	Ivory 8	X mast>mam 1+?	i8c, Su15, D1
Parrish Village Site	Hopkins	KY		any????	C?7, 4 dug
Pavo Real	Bexar	TX		B. sp. burn, 2hearth	C3+, F7
Plainview	Hale	TX		Eq AA26:58	Plainview
Pleasant Lake mastodon	Jackson	MI	1?weak	10,395/100 Beta1388	bone probe?
Potter Creek Cave	Shasta	CA	b3+1	X?bev/drill M.a.21sp	C?
Powerline Site Aucilla	Jefferson	FL	bone	X dire wolf mandible	b2c
Rawhide Buttes	Niobrara	WY		X? Mam.	?
Rawlins 48cr182=UP M?	Carbon	WY		H&E99 M.c.1ad mal	UID lithics
Rex Rodgers	Briscoe	TX		X? B.a.? 6-10 Wkill	C6-10
Roaring Springs Cave	Harney	OR		old levels??	HELP!
Ryan-Harley 8je1004	Jefferson	FL	ivory	X probo	i1c, Su8+3pre
Saltville WEAK	Smyth	VI	no tool!	Ma/Musk ox	fluted 14k
Sandia Cave Folsom	Bernarillo	NM	ivory?	Notho,I tool weak	Folsom
Sandia Cave Sandia	Bernarillo	NM	bone?	w/m&m, Ch toolweak	Sandia
Sandy Ridge	Canada	Ontario		cervid 70 burn frag	GaineyX
Santa Fe Atlatl Hook	Columbia	FL	ivory 1	X Ma>Mc atlatl hook	i1c
Santa Fe River 1A	Columbia	FL	I and B	X Ma>Mc>1 Cut Mc	Cx, i1c
Santa Fe River A2	Columbia	FL		Check Maps VP	c?
Santa Fe River A3	Columbia	FL			
Santa Fe River 12-17	Columbia	FL		X? MT stabs	?
Santa Fe River Waller	Columbia	FL	ivory 2	X 123739/123720	i2c
Santa Isabel Iztapan	Mexico	Mexico		X M.I 1 p in ribs	ScB?
Santa Isabel Iztapan 2	Mexico	Mexico		X M.i 1 p in rib/cut	angost/lerma

Schaefer	Kenosha	WI		X? Mp 2fl+cut stack	Chesrow?
Schaldack Mammoth	Cochise	AZ		CVH87a	C1
Shawnee-Minisink	Monroe	PA		X fish, salmon	C1+?
Sheaman A. B. area 9	Niobrara	WY	ivory	X Mc/B.a/A.a cut	C1, i1c
Sheriden Cave	Wyandot	OH	bone 2	X pec/probo2 points	C2? B2
Shoop	Dauphin	PA		X cervid 1/45scraper	C48 16comp
Silver River #2 General	Marion	FL	ivory	Xma>Mc biggest 1	i2c
Silver Springs 8MR59	Marion	FL	ivory	X Ma>Mc 2? Cmid	C1+,i2,Su9,Si1
Silver Springs Cavern	Marion	FL		eq ma	C,Su,Si1f
Silverhorn Rockshelter	Emery	UT	48em8	X bone frags?Fols?	C1+lance
Simpson's Flat (Ich R.)	Suwannee	FL	ivory	X mast>mam 1+?	i2c,cx? B1c
Sloth Hole 8JE121	Jefferson	FL	ivory	X M.a./Mj/Pll/holo+	C6, I>33
Smith Creek Cave	White Pine	NV		2Eq/cam 21herps	59 mammals
Spring Lake 41Hy161	Hays	TX		mam/mast/B. teeth	C3, F1
Steinhatchee River no#	Taylor	FL	bone	X Pm mt D,EqPcut	b1c
Stolle mammoth	Roosevelt	NM		X? M.c.? Brokebone	
Sugarloaf	Franklin	MA		X cervid burn/hearth	C2 +st bead
Suwannee River	Gilchrist	FL	ivory 1?	X Ma>Mc	i1c, c?
Swan Point XBD-156	no counties	AK		populas, salix	Swan?
Tampa Megalonyx	Hillsborough	FL	DEW	X pt/pelvis unconfirm	1 unknown
Tanana Valley	no counties	AK	bone	X pro?	C?
Taylor Co. (Aucilla)	Taylor	FL	ivory 1	X Ma>Mc foreshaft	i1c
Tepexpan	Mexico	Mexico		prob sk w/flake-2Mc	Eljobo-11.003
Tequixquiac	Mexico	Mexico	bone 1	X Pm sacrum coyote	b1c?
Thames River	Canada	Ontario		X? M.a. 1male	Fluted 1
Tongue Creek Site	Canada	Alberta		BaEq Hs Icefree	PlainVcvh87
Tonopah	Nye	NV		camp	C1+?
Totem Shoal	Jefferson	FL	ivory 8	X Ma>Mc	Cx,i8c,Six, Sux
Trail Creek Caves	no counties	AK		helge larsen 1968p	dug 1949
Tranquillity Site	Fresno	CA	bone 2	X? Must date, points	C1 w/A93
Trull Site	Perry	TN	ivory	X Ma Billet (if real)	i1c
Tulare (Wittsite) Lake?	Kings	CA		ex. Fauna	C30?11+
Tule LakeRS CAsis218	Siskyou	CA	bone?	X? fsh/bd/mm hearth	bi frags
Udora	Canada	Ontario		deer hare fox CRP7	Ga>C14+
Union Pacific Mammoth	Carbon	WY	bone1?	X M.c. awl	1bc? No C
Vail	Oxford	ME		X Caribou?	C79 or 15
Valsequillo	Mexico	Mexico	bone	X M.a. Tv,Ba,drawn	Pre-C?
Ventana Cave	Pima	AZ		X? split/char	C1
Vernon	Apache	AZ		kiva41:3/4	C/F30
Waccasassa River #9	Levy	FL	bone	X Eq 1 tibia tool	b1c
Wacissa River Lilliot	Jefferson	FL	ivory 1+	X Ma>Mc	i1c, c?
Wakulla Springs 8wa24	Wakulla	FL	i1	M.a.3+ Mc,Eq,Ba,G	C1Si1Su3 I?
Walker Road Mammoth	no counties	AK		MamNenana11-11.3	ChindadnX
Wally's Beach	Canada	Alberta		X E.sp others?	C3,G2,F1
Ward Island #2 w.run	Jefferson	FL		4-800ft up Lou Hill	C1, Si1, Su3
Warm Mineral Spring	Sarasota	FL			none
Wasden/Owl Cave	Bonneville	ID		Not X M.c?1 Ssunf?	F4 frags
West Run, Aucilla	Jefferson	FL	ivory 1	X Ma>Mc J Page AL	i1c
Whipple	Cheshire	NH		X? caribou	C~x
Williams Landing 8TA1	Jefferson	FL	ivory 1	X Ma>Mc fauna P1	C? i12? Six, Sux

Wilson Butte Cave	Jerome	ID	bone?	fauna?	Pre-C? 14.5
Wilson-Leonard	Williamson	TX		X Ba others 3 layers	L1, C3?, F/M/G1
Withlacoochie River	Citrus	FL	bone	X Mc? Rib mattock	b1c
Wizard's Beach	Washoe	NV	i1, b11?	X Probo 10,360/50	i1, b11?

APPENDIX 2- SPECIES LIST

Scientific Name	**Common Name**	**Site**	**State**	**Comments**
	carbonized plants	Blackwater Draw bsw	NM	X A-490 11040/500 aa31
	carbonized plants	Blackwater Draw bsw	NM	X A-491 11630/400 H66
Celtis occidentalis	hackberry	Shawnee-Minisink	PA	X 1 food
Celtis occidentalis	hackberry	Levi Rockshelter	TX	X burned
Celtis occidentalis	hackberry	Levi Rockshelter	TX	X burned
Celtis occidentalis	hackberry aug-oct	Lewisville	TX	X H1,4,8/ 0,2,3,7141516
Celtis occidentalis	hackberry	GaultWilsonLeonard	TX	lower unit 1
Celtis reticulata	netleaf hackberry	Lubbock Lake	TX	X? seeds use fruit
Scirpus sp.	bullrush (tule)	Lubbock Lake	TX	X? seeds use plant fiber
Eleocharis sp.	spikerush	Lubbock Lake	TX	seeds
Lithospermum sp.	gromwell	Lubbock Lake	TX	seeds, dye possibly
Cucurbito pepo	squash	Page-Ladson	FL	seeds but in Ma digesta
Nymphaea sp?	waterlily	Israel River Complex	NH	X charred seed/feature
Acalypha virgininica	acalypha	Shawnee-Minisink	PA	X Not food 13 aug-oct
Amaranthus sp.	amaranth	Shawnee-Minisink	PA	X 1 food fall
Rubus sp.	blackberry	Shawnee-Minisink	PA	X 15 food july-aug
Menyanthes trifoliata	buckbean	Shawnee-Minisink	PA	X 2 edible?
Chenopodium sp.	chenopod-goosefoot	Shawnee-Minisink	PA	X 23 food fall 76seed all
Physalis sp.	ground cherry	Shawnee-Minisink	PA	X must be in hearth?
Vitis sp.	grape	Shawnee-Minisink	PA	X 3 food
Crataegus sp.	hawthorn plum	Shawnee-Minisink	PA	X 15+ food oct burned
Polygonum sp.	smartweed	Shawnee-Minisink	PA	X 2 food fall
Suaeda sp.	seepweed	Lubbock Lake	TX	greens/seeds inkbush
Barbarea orthoceras	winter cress	Shawnee-Minisink	PA	X Not food 1 fall
	juniper	GaultWilsonLeonard	TX	lower unit 1
Quercus sp.	oak	GaultWilsonLeonard	TX	lower unit 1
	walnut	GaultWilsonLeonard	TX	lower unit 1
Cayra sp.	hickory nuts	Austin Cave	TN	X? nuts (uid fauna too)
Salix	willow	Swan Point	AK	X Cziv burned
Populas	uid poplar	Swan Point	AK	X Cziv burned
Gleditsia triancanthos	honey locust	Howard Gully	OK	X burned wood not food
Wasp (Sceliphren sp?)	mud dauber	Lewisville	TX	X food?nest & pup H2
Wasp (Sceliphren sp?)	mud dauber	Wilson-Leonard	TX	X? nest burn Bonebed
Mollusk	mussel	Levi Rockshelter	TX	X? probably burned
Fusconia undata	mussel	Lewisville	TX	X burned, hearth 1/16
Quadrula frustulosa	mussel	Lewisville	TX	X burned, hearth 1/2,16
Amblema plicata	mussel	Lewisville	TX	X burned,hearth 1/15,16
Gastropod	snails	Levi Rockshelter	TX	X? probably burned
Gastropod	land snails 9 sp.	Horn Rock Shelter 2	TX	X? hearth St3
Vallonia sp?	gastropod	Wasden/Owl Cave	ID	Folsom level

Stenotrema monodon	gastropod 12 of 18 H	Lewisville	TX	X burned, hearths 1,4,8
Stenotrema monodon aliciae	gastropod 12 of 18 H	Lewisville	TX	X burned, hearths 1,4,8
Anguispira alternata	gastropod 12 of 18 H	Lewisville	TX	X burned H1,4,8/671415
Polygyra texasiana	gastropod 12 of 18 H	Lewisville	TX	X burned H1,4,8/2,6,13
Mesomphix sp.	gastropod 12 of 18 H	Lewisville	TX	X burned H1,4,8/781416
Pisces	fish	Tule Lake	CA	X hearth, burn?11.450
Pisces	fishes	Aubrey	TX	X p115 burns mentioned
Pisces	fish unspecified	Dutchess Quarry C3c	NY	weak? Cave 8?
Pisces	fish unspecified	Shawnee-Minisink	PA	X in hearth
Osteichthyes	fish small	Lewisville	TX	X 1but not burn 2vert H6
Cyprinidae sp.	minnow	Wasden/Owl Cave	ID	Folsom level
Cyprinidae sp.	minnow	Lange-Ferguson	SD	
Salmonoides	salmon	Broken Mammoth	AK	CZiv?
Oncorhynchus sp.?	salmon	Shawnee-Minisink	PA	X in hearth
Salmonoides	salmon	East Wenatchee	WA	X blood on points check
Lepisosteus sp.	gar	Aubrey	TX	
Lepisosteus atractosteos	gar	Lubbock Lake	TX	
Amia calva	bowfin	Aubrey	TX	
Catastomidae sp.	sucker	Wasden/Owl Cave	ID	Folsom level
Catastomidae sp.	sucker	Aubrey	TX	
Carpoides cyprinis	quillback sucker	Lubbock Lake	TX	
Ictalurus sp.	catfishes	Aubrey	TX	
Ictalurus melas	black bullhead	Lubbock Lake	TX	
Ictalurus punctatus	channel cat	Horn Rock Shelter 2	TX	X? Strata 3 & 4
Ictalurus punctatus	channel cat	Lubbock Lake	TX	
Ictalurus sp? ameiurus	bullhead	Lubbock Lake	TX	
Centrarchidae uid.	sunfish/bass	Aubrey	TX	
Lepomis cyanellus	green sunfish	Lubbock Lake	TX	
Aplodinotus grunniens	freshwater drum	Aubrey	TX	
Aplodinotus grunniens	freshwater drum	Horn Rock Shelter 2	TX	X? hearth St3
Urodela sp.	salamander	Lange-Ferguson	SD	
Caudata uid.	salamander	Aubrey	TX	
Amphiuma means	toed-toed amphiuma	Wakulla Springs	FL	
	salamander	Sandia Cave	NM	no level
Ambystoma sp.	mole salamander	Sheriden Cave	OH	
Ambystoma tigrinum	common salamander	Lubbock Lake	TX	
Scaphiopus bombifrons	plains spadefoot toad	Lubbock Lake	TX	or hammondi/western
Scaphiopus intermontanus	GB spadefoot toad	Wasden/Owl Cave	ID	Folsom level
Anura	toad or frog	Aubrey	TX	
	toad	Sandia Cave	NM	no level
Bufo sp.	toad	Sheriden Cave	OH	
Bufo sp.	toad	Lubbock Lake	TX	
Bufo terrestris	southern toad	Hornsby Springs	FL	
Bufo cognates	plains toad	Lubbock Lake	TX	
Bufo woodhousei bexarensis	friesenhahn cavetoad	Lubbock Lake	TX	extinct subspecies
Bufo boreas	western toad	Potter Creek Cave	CA	
	frog	Warm Mineral Springs	FL	Zone 3 93-9800 NEW
Rana	frog	Coats-Hines	TN	w/M. a.+34 artifacts
Rana	frog	Horn Rock Shelter 2	TX	X? Strata 4
amphibian(s?)	frog or lizard	Lewisville	TX	X H6 leg burned mni1

Acris crepitans	cricket frog	Domebo	OK	
Acris crepitans	cricket frog	Lubbock Lake	TX	
Rana sp.	frog	Mill Iron	MT	not X
Rana catesbeiana	bullfrog	Shelton Mastodon	MI	Weak site F96
Rana catesbeiana	bullfrog	Sheriden Cave	OH	
Rana catesbeiana	bullfrog	Lubbock Lake	TX	
Rana clamitans	green frog	Shelton Mastodon	MI	Weak site F96
Rana clamitans	green frog	Sheriden Cave	OH	
Rana pipiens	N. leopard frog	Blackwater Draw bsw	NM	
Rana pipiens	N. leopard frog	Sheriden Cave	OH	
Rana pipiens	N. leopard frog	Domebo	OK	
Rana pipiens	N. leopard frog	Lange-Ferguson	SD	
Rana pipiens	N. leopard frog	Lubbock Lake	TX	
Rana sylvatica	wood frog	Sheriden Cave	OH	
Rana palustris	pickeral frog	Lubbock Lake	TX	
	turtle	Warm Mineral Spings	FL	
	turtle	Burnet Cave	NM	carapace 1
	turtle	Howard Gully	OK	
	turtles	Coats-Hines	TN	w/M. a.+34 artifacts
Chelonia uid.	turtles	Aubrey	TX	X 2 different clusters?
	turtles	Levi Rockshelter	TX	X? probably burned
Testudinata	turtles	Wilson-Leonard	TX	bone bed above Clovis
	painted pond slider	Itasca Bison Kill	MN	X? cuts? Shay 1971
Kinosternon sp.	mud/musk turtle	Aubrey	TX	X burned
Kinosternon flavescens	yellow mud turtle	Lubbock Lake	TX	
Sternotherus odoratus	common musk turtle	Sheriden Cave	OH	
Sternotherus sp.	musk turtle	Wilson-Leonard	TX	bone bed above Clovis
Cheyldra serpentina	snapping turtle	Angus	NE	300K?
Cheyldra serpentina	snapping turtle	Sheriden Cave	OH	X chopped neck vert.
Cheyldra serpentina	snapping turtle	Lubbock Lake	TX	
Chrysemys/Trachemys	pond turtle	Aubrey	TX	
Chrysemys picta	painted turtle	Angus	NE	300K?
Chrysemys picta	painted turtle	Sheriden Cave	OH	
Chrysemys picta	painted turtle	Coats-Hines	TN	w/M. a.+34 artifacts
Clemmys sp.	marsh/pond turtles	Potter Creek Cave	CA	
Emydoidea blandingii	blanding's turtle	Sheriden Cave	OH	
Graptemys sp.	map turtle	Sheriden Cave	OH	
Pseudemys sp.	cooters/red bellies	Sheriden Cave	OH	
Pseudemys nelsoni	Fl red bellied turtle	Little Salt Spring	FL	
Pseudemys floridana	common cooter	Little Salt Spring	FL	
Terrapene carolina sp.	carolina box turtle	Little Salt Spring	FL	
Terrapene carolina sp.	carolina box turtle	Domebo	OK	
Terrapene carolina	carolina box turtle	Aubrey	TX	no location listed
Terrapene carolina sp?	carolina box turtle	Kincaid Rockshelter	TX	Zone 4 on pavement
Terrapene carolina sp.	carolina box turtle	Lewisville	TX	Holman & Ferring
Terrapene carolina putnami	ex.carolina box turtle	Blackwater Draw bsw	NM	X 18 stack@hreath ago
Terrapene carolina putnami	ex.carolina box turtle	Burnet Cave	NM	Moodie79
Terrapene carolina putnami	ex.carolina box turtle	Domebo	OK	Moodie79
Terrapene carolina putnami	ex.carolina box turtle	Bee Co Buckner rnch	TX	Moodie79
Terrapene carolina putnami	ex.carolina box turtle	Lubbock Lake	TX	X?

Terrapene ornata	ornate box turtle	Blackwater Draw bsw	NM	
Terrapene canaliculata	box turtle large	Blackwater Draw GS	NM	mni 1
Terrapene canaliculata	box turtle large 12/18	Lewisville	TX	X H1,4,8/3,7,14-17mn20
Trachemys scripta	common slider	Angus	NE	300K?
Trachemys scripta	common slider	Kincaid Rockshelter	TX	Zone 4 on pavement
Trachemys scripta	common slider	Lubbock Lake	TX	chrysemys old
Trionyx sp.	softshell turtle	Aubrey	TX	mni 1
Trionyx sp.	softshell turtle	Lubbock Lake	TX	
	tortoise	Lehner Ranch	AZ	X burned
	tortoise	Potter Creek Cave	CA	bc?
Testudo sp. big	tortoise	Lewisville	TX	X H2
Testudo sp. small	tortoise	Lewisville	TX	X? H2
Gopherus or Geochelone	ext. land tortoise	Horn Rock Shelter 2	TX	X? arranged bones St3
Gopherus sp.	desert tortoise	Lewisville	TX	X hearth 0
Gopherus agassizii	desert tortoise	Conkling Cave	NM	no artifacts but H. s.
Gopherus polyphemus	gopher tortoise	Little Salt Spring	FL	
Geochelone sp.	ex.large tortoise	Lewisville	TX	Holman only
Geochelone sp.	ex.large tortoise	Lubbock Lake	TX	hesperotestudo
Geochelone crassiscutata	e. large tortoise	Little Salt Spring	FL	X? 13.4/12.3? Stake 12
Geochelone crassiscutata	e. large tortoise	Fowler Bridge	FL	X
Geochelone crassiscutata	e. large tortoise	Sloth Hole	FL	
Geochelone crassiscutata	e. large tortoise	Howard Gully	OK	X? burned?
Geochelone equicomes	w. med/lrg tortoise	Angus	NE	300K?
Geochelone wilsoni	w. small tortoise	Blackwater Draw bsw	NM	
Geochelone wilsoni	w. small tortoise	Domebo	OK	
Geochelone wilsoni	w. small tortoise	Bee Co Buckner rnch	TX	Above C1 level
Geochelone wilsoni	w. small tortoise	Lubbock Lake	TX	1 juvenile
Apolone sp.	softshell turtle	Lubbock Lake	TX	
Apolone sp.	softshell turtle	Sheriden Cave	OH	
Apolone spinifena	spiny softshell turtle	Sheriden Cave	OH	
	lizards	Sandia Cave	NM	no level
Lacertilia	lizards uid.	Aubrey	TX	no location listed
	lizards	Horn Rock Shelter 2	TX	Strata 4
Sceloporus sp.	horned fence lizard	Wasden/Owl Cave	ID	Folsom level
Sceloporus sp.	leopard fence lizard	Wasden/Owl Cave	ID	Folsom level
Sceloporus sp.	sagebrush fence lizar	Wasden/Owl Cave	ID	Folsom level
Sceloporus occidentalis	western fence lizard	Wasden/Owl Cave	ID	Folsom level
Sceloporus sp.	spiny lizard sp.	Burnet Cave	NM	4 spiny sp. possible
Crotaphytus collaris	collared lizard	Burnet Cave	NM	
Phrynosoma douglasii	short-horned lizard	Burnet Cave	NM	
Phrynosoma cornutum	texas horned lizard	Burnet Cave	NM	
Cnemidophorus sp.	whiptail/racerunner	Burnet Cave	NM	Holman only
Reptile eggs	unspecified	Lewisville	TX	X eggs in hearth
Serpentes sp.	snake	Kimmswick	MO	
Serpentes sp.	snake	Burnet Cave	NM	2 vert.=1?
Serpentes sp.	snake	Lange-Ferguson	SD	
Serpentes sp	unspecified snakes	Aubrey	TX	X burn, pres 5 locations
Serpentes sp.	unspecified snakes	Horn Rock Shelter 2	TX	Strata 4
	big snake	Levi Rockshelter	TX	X? probably burned
	snakes	Levi Rockshelter	TX	X? probably burned

Serpentes sp.	snakes	Wilson-Leonard	TX	bone bed above Clovis
Viperidae	viperous snake	Aubrey	TX	X 2 locations
Viperidae	viperous snake	Lewisville	TX	X 1,burned replace CA?
Colubrid A small	constricting snake	Lewisville	TX	X Hearth 6 H13? MNI 5
Colubrid B large	constricting snake	Lewisville	TX	X Hearth 6 verts for both
Colubridae	constricting snake	Aubrey	TX	X 3 locations
Colubridae	constricting snake	Wilson-Leonard	TX	bone bed above Clovis
Bogartophis subcularis	trans-pecos rat snake	Conkling Cave	NM	no artifacts but H. s.
Carphophis amoenis	worm snake	Lubbock Lake	TX	
Coluber constrictor	racer	Conkling Cave	NM	no artifacts but H. s.
Elephe guttata	corn snake	Lubbock Lake	TX	
Farancia abacura	mud snake	Hornsby Springs	FL	
Gyalopion canum	w.hook-nosed snake	Lubbock Lake	TX	
Heterodon nasicus	w.hog-nosed snake	Blackwater Draw bsw	NM	
Heterodon nasicus	w.hog-nosed snake	Lubbock Lake	TX	
Lampropeltis triangulum	milk snake	Lubbock Lake	TX	
Lampropeltis cf. doliata?	king/milk	Blackwater Draw bsw	NM	Harris gave name
Drymarchon (corias?)	grass snake	Lewisville	TX	X? Hearth 13?
Natricinae sp.	watersnake	Lange-Ferguson	SD	
Nerodia sp.	watersnake	Wakulla Springs	FL	
Nerodia sp.	watersnake	Sheriden Cave	OH	
Nerodia sp.	watersnake	Aubrey	TX	no location listed
Nerodia sp.	watersnake	Lewisville	TX	X? Ferring Only
Nerodia sp.	watersnake	Lubbock Lake	TX	
Nerodia erythrogaster	plainbelly watersnake	Sheriden Cave	OH	
Nerodia fasciata	southern water snake	Hornsby Springs	FL	
Nerodia taxispilota	brown water snake	Hornsby Springs	FL	
Pituophis melanoleucus	gopher snake	Mill Iron	MT	not X
Pituophis melanoleucus	bull,pine,gopher snak	Conkling Cave	NM	no artifacts but H. s.
Salvadora sp.	patch-nosed snake	Lubbock Lake	TX	
Sonora sp.	ground snake	Blackwater Draw bsw	NM	
Sonora semiannulata	ground snake	Lubbock Lake	TX	
Thamnophis sp.	garter snake?	Wakulla Springs	FL	
Thamnophis sp.	garter snake?	Sheriden Cave	OH	
Thamnophis sirtalis	garter snake	Lehner Ranch	AZ	X hearth?
Thamnophis sirtalis	garter snake	Hornsby Springs	FL	
Thamnophis sirtalis	garter snake	Blackwater Draw bsw	NM	
Thamnophis sirtalis	garter snake	Lubbock Lake	TX	
Thamnophis sauritus	eastern ribbonsnake	Blackwater Draw bsw	NM	
Thamnophis sauritus	eastern ribbonsnake	Domebo	OK	
Tropidoclonion lineatum	lined snake	Lubbock Lake	TX	
Virginia striatula	rough earth snake	Lubbock Lake	TX	
Crotalus sp?	pit viper	Domebo	OK	
Crotalus adamanteus	eastern diamondback	Hornsby Springs	FL	
Crotalus adamanteus	eastern diamondback	Little Salt Spring	FL	
Crotalus viridis	western rattlesnake	Potter Creek Cave	CA	potterensis symonomn
Crotalus atrox	western diamondback	Lubbock Lake	TX	
Crotalus atrox	western diamondback	Conkling Cave	NM	no artifacts but H. s.
Alligator mississippiensis	alligator	Sloth Hole	FL	many but age?
Alligator mississippiensis	alligator	Lewisville	TX	X 1 burned bone

Alligator mississippiensis	alligator	Kincaid Rockshelter	TX	Zone 4 on pavement	
Aves	birds	China Lake	CA	weak?	
Aves	birds	Tule Lake	CA	X? hearth 11.450	
Aves	bird	Blackwater Draw GS	NM	carpus sta A 937-230	
Aves	birds	Conkling Cave	NM	no artifacts but H. s.	
Aves	bird 1	Sandia Cave	NM	no level	
Aves	bird 2	Sandia Cave	NM	no level	
Aves	bird	Dutchess Quarry C3c	NY	weak? Cave 8?	
Aves	birds	Aubrey	TX	X burns+sm 2,med 3loc	
Aves	bird	Horn Rock Shelter 2	TX	X? hearths St3	
	birds	Levi Rockshelter	TX	X? probably burned	
Aves	birds	Lewisville	TX	X H1,4,6 egg goose/turk	
Falconformes	raptor	Lewisville	TX	X? not burned	
Phasianidae	bird	Wilson-Leonard	TX	bone bed above Clovis	
Passeriformes	perching birds	Aubrey	TX	2 locations	
	ptarmigan	Broken Mammoth	AK	CZiv?	
Geococcyx californianus conk	roadrunner	Conkling Cave	NM	no artifacts but H. s.	
Podilymbus podiceps	pied billed grebe	Hiscock	NY		
Aechmophorus occidentalis	western grebe	Burnet Cave	NM		1
Gymnogyps californianus	California condor	Burnet Cave	NM		1
Gymnogyps californianus	California condor	Conkling Cave	NM	no artifacts but H. s.	
Gymnogyps californianus	California condor	Hiscock	NY		
Cathartes aura	turkey vulture	Burnet Cave	NM		1
Cathartes aura	turkey vulture	Conkling Cave	NM	mni 1 Harris wed-old id	
Coragyps atratus	black vulture	Burnet Cave	NM		1
Coragyps atratus	black vulture	Conkling Cave	NM	MNI 47 harris web-old id	
Phalacrocorax sp.	cormorant	China Lake	CA	no site data	
Cygnus columbianus	tundra swan	Broken Mammoth	AK	X? hearth 11500/80cz4?	
Anser sp	goose/duck	Broken Mammoth	AK	Cziv young birds mostly	
Anas sp.	duck	Broken Mammoth	AK	Cziv Many egg shells	
Anas sp.	goose/duck	China Lake	CA	no site data	
Anas sp.	duck	Manis	WA	1 but age?	
Anatidae sp.	duck	Lange-Ferguson	SD		
Branta sp.	goose	China Lake	CA	no site data	
Branta canadensis	canadian goose	Broken Mammoth	AK	Cziv microblade 11-11.8	
Branta canadensis	gand goose	Lubbock Lake	TX		
Anser caerulescens	snow goose	Lubbock Lake	TX		
Anas strepora or acuta	pintail duck	Lubbock Lake	TX	X? cut?	
Anas acuta or strepora	gadwell?	Lubbock Lake	TX	X? cut?	
Anas clypeata	northern shoveler	Lubbock Lake	TX		
Anas crecca carolinensis	Am green winged teal	Lubbock Lake	TX		
Aythya sp.	bay ducks	China Lake	CA	no site data	
Oxyura sp.	stiff tailed ducks	China Lake	CA	no site data	
Buteo swainsoni	swainsons hawk	Burnet Cave	NM		1
Falco mexicanus	prairie falcon	Burnet Cave	NM		1
Falco sparverius	sparrow hawk	Burnet Cave	NM		1
Accipiter cooperi	coopers hawk	Burnet Cave	NM		1
Aquila chrysaetos	golden eagle	China Lake	CA	no site data	
Tympanuchus pallidicintus	lesser prairie chicken	Burnet Cave	NM		1
Meleagris sp.	turkey	Lubbock Lake	TX	X? cut tibiotarsus	

Meleagris gallopavo	turkey	Burnet Cave	NM		1
Meleagris gallopavo	turkey	Coats-Hines	TN	phalanx w/34 artifacts	
Meleagris crassipes	turkey	Burnet Cave	NM	not in Howard 36	
Oreortyx pictus (picta)	mountain quail	Potter Creek Cave	CA		
Oreortyx pictus (picta)	mountain quail	Burnet Cave	NM		1
Colinus virginianus	bobwhite quail	Aubrey	TX		
Rallus limieola	virginia rail	Lubbock Lake	TX		
Fulica americana	american coot	Lubbock Lake	TX		
Centrocercus urophasianus	sage grouse	Conkling Cave	NM	no artifacts but H. s.	
Grus sp.	crane	China Lake	CA	no site data	
Grus canadensis	crane	Burnet Cave	NM		1
Plataleides	wood ibis	Little Salt Spring	FL	?	
Bubo virginianus	horned owl	Burnet Cave	NM		1
Asio flammeus	short eared owl	Burnet Cave	NM		1
Athene cunicularia	burrowing owl	Lubbock Lake	TX		
Colaptes auratus	woodpecker	Burnet Cave	NM		1
Corvus corax	raven	Lubbock Lake	TX		
Xanthocephalus xanthocephal.	yellowhead blackbird	Burnet Cave	NM		1
Agelaius phoeniceus	redwing blackbird	Lubbock Lake	TX		
Fringillidae sp.	finch/sparrow/bunting	Lange-Ferguson	SD		
Pooecetes gramineus	vesper sparrow	Lubbock Lake	TX		
Loxia curvirostra	crossbill	Burnet Cave	NM		1
Animals	blood and sinew	Dietz	OR	X on points, +pollen	
Mammals	unspecified	Tule Lake	CA	X? hearth 11.450	
Mammals, small numerous	unspecified	Wasden/Owl Cave	ID	Folsom level	
Mammals, small medium	unspecified	Indian Creek	MT	UID weak!	
Mammals, small numerous	unspecified	Hiscock	NY	Ids critical	
Mammals, small numerous	unspecified	Sheriden Cave	OH	Ids critical W/arch	
Mammals, small numerous	unspecified	Howard Gully	OK	?	
Mammals, small numerous	unspecified	Shawnee-Minisink	PA	Ids critical	
Mammals?	unspecified	Johnson Site	TN	X burned bone	
Mammals sm,med, large	unspecified	Aubrey	TX	6 locations no mod?	
Mammals, small numerous	unspecified	Gault	TX	X ids critical burned	
Mammals, several	unspecified	Horn Rock Shelter 2	TX	X Strata 3 hearths 8brn	
Mammals?	unspecified	Pavo Real	TX	X? 3 bone fragments	
Mammals, var. sizes	unspecified	Wilson-Leonard	TX	bone bed above Clovis	
Didelphus virginiana	opossum	Warm Mineral Spings	FL	Zone 3 93-9800 NEW	
Didelphus virginiana	opossum	Blackwater Draw bsw	NM	harris85	
Holmesina septentrionalis	giant armadillo	Sloth Hole	FL		
Holmesina septentrionalis	giant armadillo	Wakulla Springs	FL		
Holmesina septentrionalis	giant armadillo	Horn Rock Shelter 2	TX	Upper Strata 5a mix?	
Holmesina septentrionalis	giant armadillo	Lubbock Lake	TX	X? Clovis butch area	
Dasypus novemcinctus	armadillo's	Kincaid Rockshelter	TX	Zone 4 on pavement	
Dasypus bellus	armadillo	Sloth Hole	FL		
Dasypus bellus	armadillo	Blackwater Draw bsw	NM	harris85 Westmost occ	
Glyptotherium floridanum	glyptodont	Sloth Hole	FL		
Glyptotherium floridanum	glyptodont	Lewisville	TX	X? white H0? L2 scoots	
	sloth	Wakulla Springs	FL		
	sloth	Blackwater Draw	NM		
	sloth	Etna Cave	NV		

	sloth	Fishbone Cave	NV	Cut? L3 or L4	
	sloth	Bee Co Buckner rnch	TX	Sellards UGSA1940	
Glossotherium harlani	sloth	Hornsby Springs	FL	?9880+/-270 shell oil	
Glossotherium harlani	sloth	Kimmswick	MO	X? ossicles only- skin?	
Glossotherium harlani	sloth	Aubrey	TX	X? ossicles only- skin?	
	ground sloth	Horn Rock Shelter 2	TX	Strata 2 no culture?	
Megalonyx jef. (wheatleyi)	sloth	Potter Creek Cave	CA	different size? =M.j.	
Megalonyx jeffersonii	ground sloth	Potter Creek Cave	CA		
Megalonyx jeffersonii	ground sloth	Little Salt Spring	FL		
Megalonyx jeffersonii	ground sloth	Sloth Hole	FL	X both radii cut 21337	
Megalonyx jeffersonii	ground sloth	Tampa Megalonyx	FL	X pt in pelvis unconfirm	
Megalonyx jeffersonii	ground sloth	Warm Mineral Spings	FL	rodent gnawed	
Megalonyx jeffersonii	ground sloth	Big Bone Lick	KY	1803 2 found	
Megalonyx jeffersonii	ground sloth	Kimmswick	MO	below Clovis level??	
Nothrotherium shastense	shasta g. sloth	Ventana Cave	AZ		
Nothrotherium shastense	shasta g. sloth	Potter Creek Cave	CA		
Nothrotherium shastense	shasta g. sloth	Conkling Cave	NM	X? close by 2 H. s.	
Nothrotherium shastense	shasta g. sloth	Manzano Cave	NM	bola, yel ochre w/gyp	
Nothrotherium shastense	shasta g. sloth	Sandia Cave	NM	bad?	
	shrew	Kimmswick	MO		
Soricidae	shrews	Aubrey	TX	2 locations	
	shrew?	Horn Rock Shelter 2	TX	Stratum 4	
	shrews	Levi Rockshelter	TX	X burned?	
Blarina sp.	shrew	Lubbock Lake	TX		
Blarina brevicauda	short-tailed shrew	Lange-Ferguson	SD		
Sorex sp.	shrew	Burnet Cave	NM	late addition	
Sorex cinereus	masked shrew	Blackwater Draw bsw	NM	harris85	
Sorex cinereus	masked shrew	Sheriden Cave	OH	W/arch	
Sorex cinereus	masked shrew	Lange-Ferguson	SD		
Sorex hoyi (microsorex?)	pygmy shrew	Sheriden Cave	OH	not S. c?	
Microsorex hoyi	pygmy shrew	Lange-Ferguson	SD		
Cryptotus parva	least shrew	Lewisville	TX	X 3 burned bones	
Scleroporus pinckneyi	bat	Sloth Hole	FL	Only 3 exist Check ID	
Antrous pallidus	desert bat	Potter Creek Cave	CA		
Carnivora	carnivore	DeLong	NV	in unit no level crp8:94	
Carnivora	carnivores	Aubrey	TX	3 locations	
Carnivora	carnivores	Wilson-Leonard	TX	bone bed above Clovis	
Taxidea taxus	badger	Ventana Cave	AZ		
Taxidea taxus	badger	Potter Creek Cave	CA		
Taxidea taxus	badger	Wasden/Owl Cave	ID	Folsom level	
Taxidea taxus	badger	Burnet Cave	NM		1
Taxidea sp.	badger	Conkling Cave	NM	no artifacts but H. s.	
Taxidea taxus	badger	Kincaid Rockshelter	TX	Zone 4 on pavement	
Taxidea taxus	badger	Levi Rockshelter	TX	X? probably burned	
Gulo sp.	wolverine	Blacktail Cave	MT	maybe w/Goshen	
Urocyon sp.cinereoargenteus	grey fox	Potter Creek Cave	CA		
Urocyon sp.cinereoargenteus	grey fox	Conkling Cave	NM	no artifacts but H. s.	
Urocyon sp.cinereoargenteus	grey fox	Levi Rockshelter	TX	X? probably burned	
Apolex lagopus	arctic fox	Broken Mammoth	AK	microblades 11-11.8	
Apolex lagopus	arctic fox	Swan Point	AK	Cziv lower paleosol	

Apolex lagopus	arctic fox	Udora CAN	ONT	X burned mni 1	
Vulpes macrotis	kit fox	Ventana Cave	AZ		
Vulpes macrotis	kit fox	Lubbock Lake	TX		
Vulpes vulpes	red fox	Potter Creek Cave	CA		
Vulpes vulpes	red fox	Wasden/Owl Cave	ID	Folsom level	
Vulpes vulpes	red fox	Blackwater Draw bsw	NM	harris85	
Vulpes vulpes	red fox	Burnet Cave	NM	harris85	
Vulpes velox	swift fox/kit	Blackwater Draw GS	NM		1
Vulpes velox	swift fox/kit	Burnet Cave	NM		1
Vulpes velox	swift fox/kit	Conkling Cave	NM	no artifacts but H. s.	
Vulpes macroura	western red fox	Burnet Cave	NM	1+?	
Canis lupus or dirus?	wolves	Wally's Beach	ALB	tracks only?	
Canis dirus	dire wolf	Broken Mammoth	AK	11-11.8	
Canis dirus	dire wolf	Ventana Cave	AZ		
Canis dirus	dire wolf	China Lake	CA	weak? No site data	
Canis dirus	dire wolf	Powerline/Aucilla	FL	X mandible ornaments	
Canis dirus	dire wolf	Sloth Hole	FL		
Canis dirus	dire wolf	Wasden/Owl Cave	ID	folsom level	
Canis dirus	dire wolf	Blackwater Draw GS	NM	X? 1 point w/jaw	
Canis dirus	dire wolf	Conkling Cave	NM	no artifacts but H. s.	
Canis dirus	dire wolf	Levi Rockshelter	TX	X? probably burned	
Canis dirus	dire wolf	Levi Rockshelter	TX	X? probably burned	
Canis dirus	dire wolf	Lewisville	TX	? Ferring Only	
Canis sp.?	unspecified	Escapula	AZ	harris85	
Canis sp.?	unspecified	Blackwater Draw bsw	NM	skull 937-521 H72	
Canis sp.?	unspecified	Sloth Hole	FL		
Canis sp.?	unspecified	Howard Gully	OK		
Canis sp.?	uid ~familiaris?	Coats-Hines	TN	1st phalanx 34 artifacts	
Canis sp.?	unspecified	Gault	TX		
Canis sp.?	unspecified	Wilson-Leonard	TX	bone bed above Clovis	
Canis sp.?	unspecified	Hell Gap	WY	Harris85 layer unclear	
Canis sp.?	unspecified	Sheaman AB area 9	WY		1
Canis sp.?	wolf	Broken Mammoth	AK	Cziv? 11-11.8k	
Canis sp.?	wolf	Lewisville	TX	X in hearth 1 claw	
Canis indianensis OLD	wolf or coyote?	Potter Creek Cave	CA	latrans or lupus??	
Canis lupus	timber wolf	Murray Springs	AZ	X? kill? HELP??	
Canis lupus	timber wolf	Ventana Cave	AZ		
Canis lupus	timber wolf	Blacktail Cave	MT	maybe w/Goshen	
Canis lupus	timber wolf	Blackwater Draw bsw	NM	harris85 jaw	
Canis lupus	timber wolf	Blackwater Draw GS	NM		1
Canis lupus	timber wolf	Sandia Cave	NM	bad?	
Canis lupus	timber wolf	Lubbock Lake	TX		
Canis nubulis =lupus?	buffalo wolf	Burnet Cave	NM		1
Canis latrans	coyote	Murray Springs	AZ		
Canis latrans	coyote	Ventana Cave	AZ		
Canis latrans	coyote	China Lake	CA	no site data	
Canis latrans	coyote	Tranquility Site	CA	Hewes 1946	
Canis latrans	coyote	Blackwater Draw GS	NM		1
Canis latrans	coyote	Burnet Cave	NM	2+? Big	
Canis latrans	coyote	Conkling Cave	NM	no artifacts but H. s.	

Canis latrans	coyote	Levi Rockshelter	TX	X? probably burned	
Canis latrans	coyote	Lewisville	TX	L2 jaw near H8 mni 1	
Canis latrans	coyote	Lubbock Lake	TX		
Canis microdon=latrans?	short tooth coyote	Burnet Cave	NM	Old name	
	bear	Murray Springs	AZ	X? Camp C7 verify	
Arctodus or U.americanus	cave bear	Conkling Cave	NM	X? close by 2 H. s.	
Arctodus sp.	giant Pl. bear	Burnet Cave	NM	X? mni1 4 Big verts	
Arctodus simus? My addit.	giant Pl. bear	Lubbock Lake	TX	X? radius smashed	
Euarctus=Ursus americanus?	black bear	Lewisville	TX	X in hearth 4	
Arctos simus	short face bear	Potter Creek Cave	CA	Arctodus?	
Arctos simus	short face bear	Sheriden Cave	OH		
Arctos simus	short face bear	Lubbock Lake	TX	Arctodus?	
Arctos simus	short face bear	Huntington Canyon	UT	present Arctodus?	
Ursus americanus (arctodus)	black bear	Lehner Ranch	AZ	X In hearth cub	
Ursus americanus	black bear	Potter Creek Cave	CA	H85 no A simus?	
Ursus americanus	black bear	Blackwater Draw bsw	NM	harris85	
Ursus americanus	black bear	Lewisville	TX	X H4 left canine	
Ursus arctos	brown bear	Blacktail Cave	MT	maybe w/Goshen	
Tremarctos floridanus	bear	Sloth Hole	FL	tooth?	
Monachus tropicalis	monk seal	Sloth Hole	FL	1959 extinct in Gulf	
Bassariscus astutus	ringtail/civet	Potter Creek Cave	CA		
Bassariscus astutus flavus	ringtail/civet	Burnet Cave	NM	1+?	
Bassariscus sp.	ringtail/civet	Conkling Cave	NM	no artifacts but H. s.	
Procyon lotor	racoon	Warm Mineral Spings	FL	Zone 3 93-9800 NEW	
Procyon lotor	racoon	Blackwater Draw bsw	NM	harris85	
Procyon lotor	racoon	Kincaid Rockshelter	TX	Zone 4 on pavement	
Procyon lotor	racoon	Lewisville	TX	X in hearth 4/6,14 mni 5	
Mustela nigripes	blackfoot ferret	Burnet Cave	NM	1 big- now smaller?	
Lutra canadensis	otter?	Broken Mammoth	AK	Cziv? ID suspect	
Lutra canadensis	otter	Sloth Hole	FL		
Martes americana? (nabilis)	am pine marten	Potter Creek Cave	CA	nabilis old term	
Martes americana	am pine marten	Sheriden Cave	OH		
Martes pennanti	fisher	Sheriden Cave	OH		
Mustela ermina	ermine	Sheriden Cave	OH		
Mustela frenata	long tailed weasel	Potter Creek Cave	CA		
Mustela sp?	weasel,mink,ferret+	Conkling Cave	NM	no artifacts but H. s.	
	small mustelid	Wasden/Owl Cave	ID	Owls folsom level	
	skunk	Levi Rockshelter	TX	X? probably burned	
Spilogale putorius	spotted skunk	Potter Creek Cave	CA		
Spilogale putorius	spotted skunk	Conkling Cave	NM	no artifacts but H. s.	
Conepatus mesoleucus mear.	hog-nosed skunk	Burnet Cave	NM		1
Mephitinae	small skunk	Blackwater Draw bsw	NM	harris85	
Mephitis mephitis	striped skunk	Potter Creek Cave	CA		
Mephitis mephitis	striped skunk	Conkling Cave	NM	no artifacts but H. s.	
Mephitis mephitis	striped skunk	Aubrey	TX	no location listed	
Mephitis mephitis	striped skunk	Lewisville	TX	X in hearth 4 mni 2	
Smilodon sp?	saber cat	China Lake	CA	weak? No site data	
Smilodon fatalis	saber cat	Sloth Hole	FL	not X	
Smilodon fatalis	saber cat	Warm Mineral Spings	FL		
Smilodon fatalis	saber cat	Blackwater Draw GS	NM	1 young	

Lynz rufus	lynx	Potter Creek Cave	CA		
Lynx rufus	lynx (wildcat)	Sloth Hole	FL	X Really Clovis? incised	
Lynx rufus	lynx	Burnet Cave	NM	1+?	
Lynx rufus	lynx	Conkling Cave	NM	no artifacts but H. s.	
Panthera leo atrox	american lion	Ventana Cave	AZ	F.A.??	
Panthera leo atrox	american lion	Lehner Ranch	AZ	Age/context? H85:239	
Panthera leo atrox	american lion	Potter Creek Cave	CA		
Panthera leo atrox	american lion	Sloth Hole	FL		
Felis amnicola	small cat	Sloth Hole	FL	type site	
Felis concolor	rocky mt cougar	Potter Creek Cave	CA		
Felis concolor	rocky mt cougar	Burnet Cave	NM	1 or 2	
Felis concolor	rocky mt cougar	Conkling Cave	NM	no artifacts but H. s.	
Felis concolor	rocky mt cougar	Horn Rock Shelter 2	TX	Stratum 2 no culture?	
Felis concolor	rocky mt cougar	Levi Rockshelter	TX	X? probably burned	
Pantera onca (leo atrox?)	jaguar	Ventana Cave	AZ		
Pantera onca (wrong G/sp?)	panther (jaguar!)	Warm Mineral Spings	FL		
Rodents	unspecified	Broken Mammoth	AK	Cziv? 11-11.8k	
Rodent	unspecified	Murray Springs	AZ		
Rodents microtine	unspecified	Wasden/Owl Cave	ID	Owls folsom level	
Rodent	unspecified	Kimmswick	MO		
Rodent	unspecified	Warm Mineral Spings	FL	gnawing on MJ only ev.	
Rodent	unspecified	Aubrey	TX	X burned,present 6 loci	
Rodent	unspecified	Horn Rock Shelter 2	TX	X? S3 hrth, R? in S4	
Rodent	unspecified	Wilson-Leonard	TX	bone bed above Clovis	
Cynomys ludovicianus	blacktailed prairie dog	Ventana Cave	AZ		
Cynomys ludovicianus	blacktailed prairie dog	Blackwater Draw bsw	NM	harris85	
Cynomys ludovicianus	blacktailed prairie dog	Burnet Cave	NM		1
Cynomys ludovicianus	blacktailed prairie dog	Conkling Cave	NM	no artifacts but H. s.	
Cynomys ludovicianus	blacktailed prairie dog	Lewisville	TX	X in H1,4(#5),8 mni 8	
Cynomys ludovicianus	blacktailed prairie dog	Lubbock Lake	TX		
Spermophilus sp?	ground squirrel	Wasden/Owl Cave	ID	Owls folsom level	
Spermophilus sp. (Citellus)	ground squirrel	Lewisville	TX	X in hearth 1/H4 mni 2	
Spermophilus sp.	ground squirrel	Conkling Cave	NM	no artifacts but H. s.	
Spermophilus sp.	ground squirrel	Lange-Ferguson	SD		
Spermophilus sp.	ground squirrel	Aubrey	TX	X? not counted as X	
Spermophilus beecheyi	ground squirrel	Potter Creek Cave	CA		
Spermophilus lateralis	ground squirrel	Ventana Cave	AZ		
Spermophilus lateralis	ground squirrel	Potter Creek Cave	CA		
Spermophilus richardsonii	R. ground squirrel	Lubbock Lake	TX		
Spermophilus richardsonii	R. ground squirrel	Hell Gap	WY	Harris85 layer unclear	
Spermophilus tridecemlineatus	13 lined gr. squirrel	Mill Iron	MT	not X	
Spermophilus tridecemlineatus	13 lined gr. squirrel	Lubbock Lake	TX		
Spermophilus mexicanus	mexican gr. squirrel	Lubbock Lake	TX		
Spermophilus varieqatus? Gra	rock squirrel	Burnet Cave	NM	Otospermophilus? 2+	
Spermophilus sp.	ground squirrel	Broken Mammoth	AK	Cziv?	
Sciurus sp.	squirrel	Warm Mineral Spings	FL	Zone 3 93-9800 NEW	
Sciuridae uid.	squirrel	Aubrey	TX	too old? Locus As	
Sciurus sp.	squirrel	Lewisville	TX	not niger? UT B57	
Sciurus arizonensis	squirrel	Blackwater Draw bsw	NM	harris85	
Scuirus niger	fox squirrel	Lewisville	TX	X 5 burned L2 Mni 2	

Tamiasciurus hudsonicus	red squirrel	Broken Mammoth	AK	Cziv?	
Tamiasciurus douglasi	squirrel	Potter Creek Cave	CA		
Glaucomys sabrinus	flying squirrel	Potter Creek Cave	CA		
Tamias sp.	eastern chipmunk	Potter Creek Cave	CA		
Eutamias cinereicollis	western chipmunk	Conkling Cave	NM	no artifacts-H. s. AZ	
Eutamias minimus	least chipmunk	Lange-Ferguson	SD	Tamias subgenus now	
Castoroides ohioensis	giant beaver			Algonkian myths?	
Castoroides ohioensis	giant beaver	Sloth Hole	FL		
Castoroides ohioensis	giant beaver	Bridgeport	NE	artifacts, Renaud34	
Castoroides ohioensis	giant beaver	Lime Creek	NE	only extinct form@site	
Castoroides ohioensis	giant beaver	Hiscock Site	NY	1959 find 1 tooth	
Castoroides ohioensis	giant beaver	Sheriden Cave	OH	W/arch	
Castoroides sp.	beaver	Bull Brook	MA	?	
Castoroides canadensis	beaver	Sloth Hole	FL		
Aplodontia rufa	mountain beaver	Potter Creek Cave	CA		
Geomys bursarius	plains pocket gopher	Domebo	OK		
Geomys bursarius	plains pocket gopher	Blackwater Draw bsw	NM	harris85	
Geomys bursarius	plains pocket gopher	Aubrey	TX	X lots burned 5 loci	
Geomys bursarius	plains pocket gopher	Lewisville	TX	X 1 burned bone	
Geomys sp.	pocket gopher	Wasden/Owl Cave	ID	Owls folsom level	
Geomys sp.	pocket gopher	Blackwater Draw GS	NM	harris85	
Geomys sp.	pocket gopher	Conkling Cave	NM	no artifacts but H. s.	
Geomys sp.	pocket gopher	Wilson-Leonard	TX	bone bed above Clovis	
Geomys sp.	yellow cheek p goph	Wilson-Leonard	TX	Clovis like layer	
Geomys bursarius	plains pocket gopher	Lubbock Lake	TX		
Thomomys microdon	gopher	Potter Creek Cave	CA		
Thomomys umbrinus	interm pocket gopher	Burnet Cave	NM	harris85 2 or 3 (fulvus?)	
Thomomys bottae	valley pocket gopher	Potter Creek Cave	CA		
Thomomys bottae	valley pocket gopher	Burnet Cave	NM	harris85 2 or 4 (fulvus?)	
Thomomys bottae	valley pocket gopher	Conkling Cave	NM	no artifacts/H.s. Har85	
Thomomys bottae	valley pocket gopher	Lubbock Lake	TX		
Thomomys talpoides	N. pocket gopher	Mill Iron	MT	not X	
Thomomys talpoides	N. pocket gopher	Sandia Cave	NM	no level	
Thomomys talpoides	N. pocket gopher	Lange-Ferguson	SD		
Cratogeomys castanops	chestnut p. gopher	Burnet Cave	NM	2+	
Pappogeomys castanops	pocket gopher	Burnet Cave	NM		1
	mouse	Warm Mineral Spings	FL	Zone 3 93-9800 NEW	
	mice	Kincaid Rockshelter	TX	Zone 4 on pavement	
	mice and rats	Lewisville	TX	X hearths 8 and 15	
	rats	Lewisville	TX	X hearth 14	
Orzomys palustris	rice rat	Aubrey	TX	Locus Ap	
Orzomys palustris	rice rat	Lewisville	TX	X 1 burned bone	
Neotoma micropus	south. plains woodrat	Ventana Cave	AZ		
Neotoma micropus	south. plains woodrat	Lubbock Lake	TX		
Neotoma sp.	pack or wood rat	Blackwater Draw bsw	NM	harris85	
Neotoma sp.	woodrat	Aubrey	TX	2 locations	
Neotoma sp.	pack or wood rat	Lewisville	TX	X H4,8/0,6 mni 4	
Neotoma sp.	woodrat	Wilson-Leonard	TX	bone bed above Clovis	
Neotoma sp.?	bushy tail wood rat	Sandia Cave	NM	no level	
Neotoma cinera (Teonoma)	bushy tail wood rat	Potter Creek Cave	CA		

Neotoma cinerea	woodrat	Potter Creek Cave	CA		
Neotoma cinerea orolestes	CO woodrat	Burnet Cave	NM	9+?	
Neotoma cinerea	woodrat	Conkling Cave	NM	no artifacts but H. s.	
Neotoma albigola	woodrat	Murray Springs	AZ		
Neotoma albigola	woodrat	Conkling Cave	NM	no artifacts but H. s.	
Neotoma floridanus	eastern woodrat	Lewisville	TX	X 2 burned bones	
Neotoma mexicana	Mex woodrat	Burnet Cave	NM	2+?	
Neotoma lepida	small woodrat	Burnet Cave	NM	1+	
Sigmodon hispidus	cotton rat	Blackwater Draw bsw	NM	harris85	
Sigmodon hispidus	cotton rat	Domebo	OK		
Sigmodon hispidus	cotton rat	Aubrey	TX	3 locations	
Sigmodon hispidus	cotton rat	Lewisville	TX	X 9 burned bones	
Perognathus sp.	pocket mouse	Murray Springs	AZ		
Perognathus sp.	pocket mouse	Aubrey	TX	Camp B	
Perognathus sp.	pocket mouse	Lubbock Lake	TX		
Perognathus hispidus	pocket mouse	Domebo	OK		
Perognathus hispidus	pocket mouse	Kincaid Rockshelter	TX	Zone 4 on pavement	
Dipodomys sp.	kangaroo rat	Conkling Cave	NM	no artifacts but H. s.	
Dipodomys sp.	kangaroo rat	Aubrey	TX	no location listed	
Dipodomys ordi	kangaroo rat	Burnet Cave	NM	replace Dmr?	
Dipodomys montanus rich.	kangaroo rat	Burnet Cave	NM	Perodipus 1 or 2?	
Onychomys leucogaster	n. grasshopper mouse	Lubbock Lake	TX		
Onychomys leucogaster	n. grasshopper mouse	Lange-Ferguson	SD		
Reithrodontomys megalotis	harvest mouse	Mill Iron	MT	not X	
Reithrodontomys megalotis	harvest mouse	Blackwater Draw bsw	NM	harris85	
Reithrodontomys sp.	harvest mouse	Lange-Ferguson	SD		
Reithrodontomys sp.	harvest mouse	Aubrey	TX	Camp B	
Reithrodontomys montanus	plains harvest mouse	Lubbock Lake	TX		
Peromyscus sp.	fieldmouse	Conkling Cave	NM	no artifacts but H. s.	
Peromyscus sp.	fieldmouse	Lewisville	TX	X? mni 3	
Peromyscus eremicus	cactus mouse	Lubbock Lake	TX		
Peromyscus gossypinus	cotton mouse	Lewisville	TX	X H4,8 Pg/Pl mni 8	
Peromyscus truei	mouse	Blackwater Draw bsw	NM	harris85	
Peromyscus leucopus	white-footed mouse	Blackwater Draw bsw	NM	harris85	
Peromyscus leucopus	white-footed mouse	Lange-Ferguson	SD		
Peromyscus leucopus	white-footed mouse	Lewisville	TX	X hearths 4 & 8 manic?	
Peromyscus maniculatus	deer mouse	Mill Iron	MT	not X	
Peromyscus maniculatus	deer mouse	Burnet Cave	NM		1
Peromyscus maniculatus	deer mouse	Aubrey	TX	Camp B	
Peromyscus maniculatus	deer mouse	Sheaman AB area 9	WY		1
Peromyscus maniculatus	deer mouse	Hell Gap	WY	Harris85 layer unclear	
Zapus hudsonius	meadow jump mouse	Lange-Ferguson	SD		
Ondatra zibethicus	muskrat	Lehner Ranch	AZ	X? on Cl surface,breaks	
Ondatra zibethicus	muskrat	Page/Ladson	FL	MNI 4?	
Ondatra zibethicus	muskrat	Sloth Hole	FL	MNI 30 extirpated in FL	
Ondatra zibethicus	muskrat	Blackwater Draw bsw	NM	harris85	
Ondatra zibethicus	muskrat	Blackwater Draw GS	NM		1
Ondatra zibethicus	muskrat	Domebo	OK	natural?	
Ondatra zibethicus	muskrat	Lange-Ferguson	SD		
Ondatra zibethicus	muskrat	Coats-Hines	TN	hum/metapod 34artifact	

Ondatra zibethicus	muskrat	Aubrey	TX	Camp B, Area C	
Ondatra zibethicus	muskrat	Levi Rockshelter	TX	X? probably burned	
Ondatra zibethicus	muskrat	Lubbock Lake	TX	X? breakage regular	
Ondatra zibethicus	muskrat	Wilson-Leonard	TX	Bone bed above Clovis	
Ondatra zibethicus	muskrat	Manis	WA	1 but age?	
Synaptomys cooperi	s. bog lemming	Domebo	OK		
Synaptomys cooperi	s. bog lemming	Aubrey	TX	4 locations	
Synaptomys cooperi	s. bog lemming	Lewisville	TX	X 5 burned bones	
Synaptomys sp?	bog lemming	Wilson-Leonard	TX	iGl Below Clovis	
Synaptomys borealis	n. bog lemming	Sheriden Cave	OH		
Lagurus curtatus	sage vole=step lemm	Burnet Cave	NM		
Clethrionomys gaperri?	yellow cheek vole	Sheriden Cave	OH	W/arch only USA sp.	
Microtus xanthognathus	yellow cheek vole	Sheriden Cave	OH	HELP good?	
Clethrionomys gaperri	redbacked vole	Lange-Ferguson	SD		
Clethrionomys gaperri	redbacked vole	Sheaman AB area 9	WY		
Phenacomys intermedius?	heather vole	Sheriden Cave	OH	W/arch	
Phenacomys intermedius	heather vole	Sheaman AB area 9	WY		1
Scapanus latimanus	west america mole	Potter Creek Cave	CA		
Scalopus aquaticus	eastern mole	Aubrey	TX	Camp B	
Scalopus aquaticus	eastern mole	Lewisville	TX	X in hearth 4 mni 1	
Microtines	UID	Indian Creek	MT	UID beyond this	
Microtus sp.	vole	Sloth Hole	FL		
Microtus sp.	vole	Aubrey	TX	all 6 loci	
Microtus sp.	vole	Lewisville	TX	X 2 burned HXXX	
Microtus sp.	vole	Sheaman AB area 9	WY	3+sp not M.penn	
Microtus californicus	vole	Potter Creek Cave	CA		
Microtus pennsylvanicus	meadow vole	Blackwater Draw bsw	NM	harris85	
Microtus pennsylvanicus	meadow vole	Blackwater Draw GS	NM		
Microtus pennsylvanicus	meadow vole	Burnet Cave	NM	replace Mmg?	
Microtus pennsylvanicus	meadow vole	Sandia Cave	NM	no level	
Microtus pennsylvanicus	meadow vole	Lange-Ferguson	SD		
Microtus pennsylvanicus	meadow vole	Lewisville	TX	X H4 or 8 both? H6	
Microtus pennsylvanicus	meadow vole	Lubbock Lake	TX		
Microtus pennsylvanicus	meadow vole	Sheaman AB area 9	WY	mni 2?	
Microtus longicaudus/mordax	R. mt meadow mouse	Burnet Cave	NM	1+?	
Microtus longicaudus	long-tailed vole	Mill Iron	MT	not X	
Microtus longicaudus	long-tailed vole	Sheaman AB area 9	WY		2
Microtus montanus	vole	Hell Gap	WY	Harris85 layer unclear	
Microtus ochrogaster	prairie vole	Sandia Cave	NM	no level	
Microtus ochrogaster	prairie vole	Mill Iron	MT	not X	
Microtus ochrogaster	prairie vole	Blackwater Draw bsw	NM	harris85	
Microtus ochrogaster	prairie vole	Blackwater Draw	NM		
Microtus ochrogaster/pinetoru	prairie vole	Domebo	OK		
Microtus ochrogaster	prairie vole	Lubbock Lake	TX		
Microtus pinetorum	woodland vole (pine)	Horn Rock Shelter 2	TX	Stratum 4	
Microtus mexicanus	mt meadow mouse	Blackwater Draw bsw	NM	harris85	
Microtus mexicanus guad.	G. mt meadow mouse	Burnet Cave	NM	2+?	
Microtus mexicanus	mt meadow mouse	Conkling Cave	NM	no artifacts but H. s.	
Erethizon dorsatum	porcupine	Broken Mammoth	AK	Cziv?	
Erethizon dorsatum	porcupine	Sheriden Cave	OH	W/arch	

Erethizon dorsatum	porcupine	Hell Gap	WY	Harris85 layer unclear	
Neochoerus pinckneyi	capybara	Aucilla 1A	FL	X? D hum 137905sp brk	
Neochoerus pinckneyi	capybara	Sloth Hole	FL	teeth?	
Hydrochaeris holmsei	capybara	Sloth Hole	FL	teeth?	
	rabbits	Little Salt Spring	FL	?	
	rabbit	Warm Mineral Spings	FL	Zone 3 93-9800 NEW	
Leporidae sp.	rabbits	Aubrey	TX	Locus Arw only	
Leporidae sp.	rabbit	Wilson-Leonard	TX	Bone bed above Clovis	
	rabbit	East Wenatchee	WA	X blood on points	
Leporidae sp.	hare	Udora CAN	ONT	X 1 burned CRP5	
Sylvilagus sp. but?	sagebrush rabbit	Wasden/Owl Cave	ID	Owls folsom level	
Sylvilagus sp.	cottontail rabbit	Lehner Ranch	AZ	X	
Sylvilagus sp.	cottontail rabbit	Kimmswick	MO		
Sylvilagus sp.	cottontail rabbit	Gault	TX		
Sylvilagus sp.	cottontail rabbit	Levi Rockshelter	TX	X? probably burned	
Sylvilagus sp.	cottontail rabbit	Wilson-Leonard	TX	Bone bed above Clovis	
Sylvilagus floridanus/Nuttallii?	large cottontail	Burnet Cave	NM	2+ add-replace w/Nut?	
Sylvilagus floridanus/Nuttallii?	large cottontail	Conkling Cave	NM	no artifacts but H. s.	
Sylvilagus floridanus	large cottontail	Aubrey	TX	X Camp B burn+2 loci	
Sylvilagus floridanus	large cottontail	Lewisville	TX	X H1or4 both?H2 3 4 6	
Sylviolagus nuttallii	cottontail rabbit	Sandia Cave	NM	no level	
Sylvilagus nuttallii/audoboni	cottontail rabbit	Sheaman AB area 9	WY	X? 1	
Sylvilagus auduboni	NM cottontail	Potter Creek Cave	CA		
Sylvilagus auduboni	NM cottontail	Burnet Cave	NM		1
Sylvilagus auduboni	NM cottontail	Conkling Cave	NM	no artifacts but H. s.	
Lepus americanus	snowshoe hare	Broken Mammoth	AK	Cziv	
Lepus americanus	snowshoe hare	Potter Creek Cave	CA		
Lepus americanus	snowshoe hare	Lange/Ferguson	SD	distal femur	
Lepus sp.	rabbit	Murray Springs	AZ	X? Camp C7 verify	
Lepus sp.?	jackrabbit	Indian Creek	MT	Tent ID crp2:45	
Lepus sp.	jackrabbit	Blackwater Draw bsw	NM	harris85	
Lepus sp.	jackrabbit	Conkling Cave	NM	no artifacts but H. s.	
Lepus sp.	jackrabbit	Levi Rockshelter	TX	X? probably burned	
Lepus sp.	jackrabbit	Lewisville	TX	X H1 or 4?4,15notx m9	
Lepus sp.	jackrabbit	Colby	WY		
Lepus sp.	jackrabbit	Hell Gap	WY	Harris85 layer unclear	
Lepus alleni	antelope jackrabbit	Burnet Cave	NM	La & Lt same?	
Lepus townsendii	white tailed jackrabbit	Burnet Cave	NM	1+?	
Lepus californicus	black tailed jackrabbit	Lehner Ranch	AZ	X	
Lepus californicus	black tailed jackrabbit	Ventana Cave	AZ		
Lepus californicus	black tailed jackrabbit	Potter Creek Cave	CA		
Lepus californicus	black tailed jackrabbit	Aubrey	TX	X? Might be X Camp B	
Lepus californicus	black tailed jackrabbit	Lubbock Lake	TX		
Marmota flaviventris	marmot	Potter Creek Cave	CA		
Marmota flaviventris	marmot	Indian Creek	MT	X? crp1:9 calcined?	
Marmota flaviventris	marmot	Burnet Cave	NM	3 or 6+?	
Marmota flaviventris	marmot	Sandia Cave	NM	no level	
Marmota flaviventris	marmot	Fishbone Cave	NV	L3 or L4	
Marmota flaviventris	marmot	Hell Gap	WY	Harris85 layer unclear	
Platygonus sp.	flat head peccary	Potter Creek Cave	CA		

Platygonus sp.	flat head peccary	Blackwater Draw GS	NM	jaw no # base of GS	
Platygonus sp.	flat head peccary	Lewisville	TX	NFD WOW??	
Platygonus alemani (comp?)	peccary	Lewisville	TX	X Hearth 4 teeth	
Platygonus compressus	flat head peccary	Murray Springs	AZ	3 Um frags L19oc Intfac	
Platygonus compressus	flat head peccary	12 Mile Creek	KS	S52:47=Russell Spring	
Platygonus compressus	flat head peccary	Levi Rockshelter	TX	X? probably burned	
Platygonus compressus	flat head peccary	Levi Rockshelter	TX	X? probably burned	
Platygonus compressus	flat head peccary	Lubbock Lake	TX	p2 down	
Platygonus compressus	flat head peccary	Sheriden Cave	OH	X 1shot MNI 40, burned	
Platygonus compressus	flat head peccary	Agate Basin Area 2	WY	X? mandible frag-burnt?	
Tayassu tajacu	javelina(collared pec)	Ventana Cave	AZ	modifications?	
	camel	Wally's Beach	ALB	tracks	
Camelidae	camelid	Escapula	AZ	harris85	
	camelid	Potter Creek Cave	CA		
	camel	Wakulla Springs	FL		
	camel	Warm Mineral Spings	FL		
	camel	Wasden/Owl Cave	ID	1 bone, folsom level	
	camel	Etna Cave	NV	ID might have been bad	
	camel	Isleta Cave	NM	WEAK	
	camel	Bee Co Buckner rnch	TX	3 jaw, 1 MT- mix C1+2L	
	camel	Carter/Kerr-McGee	WY	X? char,broken,scraped	
	camel	Casper Site	WY	not X Hell Gap level	
	camel	Baja	MEX	X? split and charred	
Camelops sp.	camel	China Lake	CA	no site data	
Camelops sp.	camel	Lindenmeier	CO	5 foot, 2 teeth Intrusive?	
Camelops sp.	camel	Blackwater Draw GS	NM		1
Camelops sp.	camel	Burnet Cave	NM		1
Camelops sp.	camel	Conkling Cave	NM	no artifacts but H. s.	
Camelops sp.	camel	Manzano Cave	NM	bola, strata mixed	
Camelops sp.	camel	Sandia Cave	NM	bad?	
Camelops sp.	camel	Sandia Cave	NM	bad?	
Camelops hesternus	camel	Sandia Cave	NM	crp18 11.850-13.700	
Camelops sp.	camel	Fishbone Cave	NV	X? L3 split burned	
Camelops sp.	camel	Fishbone Cave	NV	X? L4 sp/brn 11227/400	
Camelops sp.	camel	Bonfire Shelter	TX	X? cut split? E.J.77:70	
Camelops sp.	camel	Lewisville	TX	X? 1bone eq/c/ba?mn2?	
Camelops sp.	camel	Midland	TX	Gazin55 midland book	
Camelops sp.	camel	A B Area 2	WY	Weak tool l. tibia	
Camelops sp 11.5av2	camel	A B Area 3 Brewster	WY	X? cut phl? 3tools2bone	
Camelops sp.	camel	Colby	WY	X? radius tool? 2nd best	
Camelops hesternus	camel	Lehner Ranch	AZ	X? split? Best case	
Camelops hesternus	camel	Murray Springs	AZ		
Camelops hesternus	camel	Kincaid Rockshelter	TX	Zone 4 on pavement	
Camelops hesternus	camel	Lubbock Lake	TX	X? split hum/tib/phal.	
Camelops hesternus	camel	Rawlins	WY		
Hemiauchenia sp.	small camel	Conkling Cave	NM	no artifacts but H. s.	
Hemiauchenia sp.	small camel	Swan Point	AK	middle paleosol Humer.	
Hemiauchenia macrocephala	small camel	Lehner Ranch	AZ		
Hemiauchenia macrocephala	small camel	Sloth Hole	FL		
Hemiauchenia macrocephala	small camel	Blackwater Draw GS	NM		3

Hemiauchenia macrocephala	small camel	Sandia Cave	NM	crp18 11.850-13.700	
Hemiauchenia macrocephala	small camel	Lubbock Lake	TX	rM1 up &dwn	
Tanaolama??	llama?	China Lake	CA	no site data davis82	
Palaeolama mirifica	llama	Hendrix Collection	FL	X prox phalanx atlatl	
Palaeolama mirifica	llama	?SANTA FE RIVER	FL	X	
Palaeolama mirifica	llama	Sloth Hole	FL	X? metatarsal d end cut	
Palaeolama mirifica	llama	Steinhatchee #2	FL	X metaT ground dag?	
Palaeolama mirifica	llama	Blackwater Draw	NM	G Haynes 2002	
Palaeolama mirifica	llama 1871find	Tequixquiac	MEX	X sacrum=coyote head	
Stockoceras conklingi	conkling's pronghorn	Ventana Cave	AZ		
Stockoceras onusrosagris	quentin's pronghorn	Burnet Cave	NM	2+?	
Stockoceras sp.	extinct antelope	Conkling Cave	NM	no artifacts but H. s.	
Antilocaprid	antelope	Blackwater Draw GS	NM	1 teeth only	
Antilocaprid	antelope	Gault	TX		
Antilocapra americana	pronghorn antelope	Ventana Cave	AZ	Could be just Stock c!	
Antilocapra americana	pronghorn antelope	Wasden/Owl Cave	ID	folsom level	
Antilocapra americana	pronghorn antelope	Burnet Cave	NM		1
Antilocapra sp.	pronghorn antelope	Conkling Cave	NM	no artifacts but H. s.	
Antilocapra americana	pronghorn antelope	Lewisville	TX	???	
Antilocapra americana	pronghorn antelope	Colby	WY	1r ulna	
Antilocapra americana	pronghorn antelope	Sheaman A.B.area 9	WY	X Mt groove/snap	
Capromeryx minor	diminutive pronghorn	Blackwater Draw bsw	NM	harris85	
Capromeryx minor	diminutive pronghorn	Blackwater Draw	NM	teeth only?	
Capromeryx minor	diminutive pronghorn	Conkling Cave	NM	no artifacts but H. s.	
Capromeryx minor	diminutive pronghorn	Sandia Cave	NM	crp18 11.850-13.700	
Capromeryx minor	diminutive pronghorn	Midland	TX	E.J.87:88 3layers	
Capromeryx minor	diminutive pronghorn	Lubbock Lake	TX	Clovis level	
Capromeryx minor	diminutive pronghorn	Lubbock Lake	TX	Folsom-above is all A.a.	
Cervid large	unspecified	Swan Point	AK	Cziv?	
Cervid large	unspecified	Ventana Cave	AZ		
Cervid	unspecified	Sugarloaf	MA	X burn/hearth st bead+	
Cervid	unsp. Caribou?	Isreal River Cplx IV	NH	X cervid on flake tool	
Cervid	unspecified	Blackwater Draw	NM		
Cervid	unspecified	Shoop	PA	X 1/45 scrapers	
Cervid	unspecified	Lange/Ferguson	SD		
Cervid	unspecified	Sandy Ridge	ONT	X 70 burned frgments	
Sangamona fugitiva=Nf?	stilt legged deer	Burnet Cave	NM	2+? Navaho fricki?	
Navahoceros fricki	mountain deer	Burnet Cave	NM	Rangifer old	
Navahoceros fricki	mountain deer	Sandia Cave	NM	crp18 11.850-13.700	
Alces alces	moose	Broken Mammoth	AK	Cziv?	
Cervalces scotti	stag moose	Farview MI? Too	NY	no artifacts- weak	
Cervalces scotti	stag moose	Hiscock	NY	3 teeth	
Cervalces scotti	stag moose	Sheriden Cave	OH		
Cervus elaphas	elk/wapati	Broken Mammoth	AK	11060/90 Cziv fall kill?	
	elk	Hiscock	NY	X? bones+1 Cl crp3:22	
Rangifer tarandus	caribou	Wally's Beach	ALB	bones but no assoc.	
Rangifer tarandus	caribou	Broken Mammoth	AK	Cziv fall kill?	
Rangifer tarandus	caribou	Big Bone Lick	KY	1803 Clovis finds	
Rangifer tarandus	caribou	Bull Brook	MA	X ANEA 12	
Rangifer tarandus	caribou	Whipple	NH	X on tools Grimes84	

Rangifer tarandus	caribou	Dutchess Quarry C1	NY	bad?
Rangifer tarandus	caribou	Dutchess Quarry C8?	NY	bad? Cave 3c?
Rangifer tarandus	caribou	Hiscock	NY	
Rangifer tarandus	caribou	Vail	ME	X? on tools no bone?
Rangifer tarandus	caribou	Holcombe Beach	MI	X on tool
Rangifer tarandus	caribou	Sheriden Cave	OH	In arch layer
Rangifer tarandus	caribou	Manis	WA	1 but age?
Rangifer tarandus	caribou	Debert CAN	NSC	X blood on points
Rangifer tarandus	caribou	Udora CAN	ONT	X burned MNI 2
Odocoileus/Antilocapra	deer or pronghorn	Aubrey	TX	find out! Ap locus
Odocoileus/Antilocapra	deer or pronghorn	Wilson-Leonard	TX	Bone bed above Clovis
Odocoileus sp.	deer	China Lake	CA	1 bone, no site data
Odocoileus sp. A	deer	Potter Creek Cave	CA	
Odocoileus sp. B	deer	Potter Creek Cave	CA	
Odocoileus sp.	deer	Warm Mineral Spings	FL	Zone 3 93-9800 NEW
Odocoileus sp.	deer	Blackwater Draw GS	NM	X cut bone 937-687
Odocoileus sp.	deer	Martins Creek	OH	X blood wear assoc.
Odocoileus sp.	deer	Coats-Hines	TN	antler 34 artifacts
Odocoileus sp.	deer	Wilson-Leonard	TX	Bone bed above Clovis
Odocoileus sp.	deer	East Wenatchee	WA	X blood on points
Odocoileus sp.	deer	Udora CAN	ONT	X but ID?<caribou
Odocoileus virginianus	whitetail deer	Hendrix Santa Fe 1A	FL	X metacarpal flute Age?
Odocoileus virginianus	whitetail deer	Ich. Little Spring Run	FL	X cut bone
Odocoileus virginianus	whitetail deer	Sloth Hole	FL	X some Clovis age?
Odocoileus virginianus	whitetail deer	Jacob's Cavern	MO	X 1L hum 1 Ma 2 Ov pic
Odocoileus virginianus	whitetail deer	Kimmswick	MO	
Odocoileus virginianus	whitetail deer	Burnet Cave	NM	4+?
Odocoileus virginianus	whitetail deer	Aubrey	TX	X Ap mni 2, Camp b, F
Odocoileus virginianus	whitetail deer	Levi Rockshelter	TX	X? probably burned
Odocoileus virginianus	whitetail deer	Lewisville	TX	X H1,4/0,2,4,14,17
Odocoileus hemionus	mule deer	Ventana Cave	AZ	
Odocoileus hemionus	mule deer	Blackwater Draw bsw	NM	harris85
Odocoileus hemionus	mule deer	Burnet Cave	NM	2+?
Odocoileus hemionus	mule deer	Lewisville	TX	X? H1,4 9 deer total
Bovine	unspecified	East Wenatchee	WA	X blood on points
Bovine	unspecified	Wally's Beach	ALB	X blood on 1Clovis point
Bison sp.	extinct bison?	Potter Creek Cave	CA	
Bison sp.	extinct bison?	Kimmswick	MO	
Bison sp.	entinct bison?	Conkling Cave	NM	no artifacts but H. s.
Bison sp.	extinct bison?	Lucy	NM	real site?
Bison sp.	entinct bison?	Howard Gully	OK	X? 1 burned?
Bison sp.	extinct bison?	Lange/Ferguson	SD	X?
Bison sp.	extinct bison?	Levi Rockshelter	TX	X? probably burned
Bison sp.	extinct bison?	Levi Rockshelter	TX	X? probably burned
Bison sp.	extinct bison?	Bee Co Buckner rnch	TX	Sellards UGSA1940
Bison sp.	extinct bison?	Horn Rock Shelter 2	TX	X? St4, St2no
Bison sp.	extinct bison?	Pavo Real	TX	X? 2 hearths burn teeth
Bison sp.	extinct bison?	Spring Lake Terrace	TX	teeth only?
Bison sp.	entinct bison?	Wilson-Leonard	TX	2 bone bed above Clovis
Bison sp.	extinct bison?	East Wenatchee	WA	X blood on points

Bison sp.	extinct bison?	Carter/Kerr-McGee	WY	
Bison sp.	extinct bison	Baja	MEX	X? split and charred
Bison antiquus	extinct bison	Tongue Creek Site	ALB	w/Hs cvh 87
Bison antiquus	extinct bison	Wally's Beach	ALB	bones but no assoc.
Bison antiquus	extinct bison	Broken Mammoth	AK	Cziv fall kill? Nenana
Bison antiquus	extinct bison	Lehner Ranch	AZ	X
Bison antiquus	extinct bison	Murray Springs	AZ	X 12 (6-10) 11/C10kill
Bison antiquus	extinct bison	Naco	AZ	
Bison antiquus	extinct bison	Ventana Cave	AZ	
Bison antiquus	extinct bison	China Lake	CA	weak? No site data
Bison antiquus	extinct bison	Alexon	FL	X (1X, 1?)
Bison antiquus	extinct bison	Harney Gap	FL	X? 8HI382 Help
Bison antiquus	extinct bison	Bent Palm (Aucilla)	FL	X? numerous cuts
Bison antiquus	extinct bison	Wakulla Springs	FL	
Bison antiquus	extinct bison	Wasden/Owl Cave	ID	X rib/scapula tips stuck
Bison antiquus	extinct bison	12 Mile Creek	KS	X 12 cuts/assoc
Bison antiquus	extinct bison	Big Bone Lick	KY	1803 2 finds
Bison antiquus	extinct bison	Itasca Bison Kill	MN	X but how old?
Bison antiquus	extinct bison	Indian Creek	MT	X? crp1:9 bone utilized
Bison antiquus	extinct bison	Mammoth Meadow I	MT	teeth bones -hair site
Bison antiquus	extinct bison	Mill Iron	MT	X MNI 30+ p/rib Lf/Ew
Bison antiquus	extinct bison	Bridgeport	NE	artifacts, Renuad34
Bison antiquus	extinct bison	Blackwater Draw	NM	harris85
Bison antiquus	extinct bison	Blackwater Draw GS	NM	X 7/Cl, 4@10.8
Bison antiquus	extinct bison	Burnet Cave	NM	X 1+ w/c in hearth
Bison antiquus	extinct bison	Sandia Cave	NM	bad?
Bison antiquus	extinct bison	Sandia Cave	NM	bad?
Bison antiquus	extinct bison	Domebo	OK	
Bison antiquus	extinct bison	Jake Bluff	OK	X mni 15, no other taxa
Bison antiquus	extinct bison	Aubrey	TX	X Arw2-1calf,cuts+3Ap
Bison antiquus	extinct bison	Gault	TX	upper C levels mostly
Bison antiquus	extinct bison	Lewisville	TX	X H0,1 +uid bone mn2?
Bison antiquus	extinct bison	Leon Creek	TX	X? Folsom mix?
Bison antiquus	extinct bison	Lubbock Lake	TX	
Bison antiquus	extinct bison	Rex Rodgers	TX	X?6-10 Speer75 help!
Bison antiquus	extinct bison	Manis	WA	3 but age?
Bison antiquus	extinct bison	Colby	WY	X? mni? Poss B. bison
Bison antiquus	extinct bison	Sheaman A.B.area 9	WY	X cut,red ochre 3+?
Bison antiquus	extinct bison	Valsequillo Valsequila	MEX	? Drawn on Ma pelvis
Euceratherium collinum mor.	shrub muskox	Potter Creek Cave	CA	
Euceratherium collinum mor.	shrub muskox	Burnet Cave	NM	1+?
Preptoceras sinclairi neomex.	muskox	Burnet Cave	NM	X 1 w/c in hearth
Bootherium bombifrons	muskox	Blacktail Cave	MT	maybe w/Goshen
	muskox	Big Bone Lick	KY	1803 2 finds
	muskox	Colby	WY	maybe present
	muskox	Wally's Beach	ALB	bones but no assoc.
Oreamnos americanus	mountain goat	Potter Creek Cave	CA	
Ovis dalli	dall sheep	Broken Mammoth	AK	Cziv? Nenana? Micro!
Ovis auduboni	dall?	Burnet Cave	NM	1+? Who no O.aud
Ovis canadensis	bighorn sheep	Burnet Cave	NM	

Ovis or Odocoileus femur	Mt sheep or deer	Colby	WY	X? weak tool sp UID	
Equus sp.	horse	Tongue Creek Site	ALB	w/Hs cvh 87	
Equus sp.	horse	Escapula	AZ	G Haynes 2002	
Equus sp.	horse	Lehner Ranch	AZ		
Equus sp.	horse	Murray Springs	AZ	X? tool? Area 5	
Equus sp.	horse	Naco	AZ		
Equus sp.	horse	Schaldack	AZ		
Equus sp.	horse large	China Lake	CA	no site data	
Equus sp.	horse small	China Lake	CA	no site data	
Equus sp.	horse	Dutton	CO	X? tool?	
Equus sp.	horse	Klein II	CO		
Equus sp.	horse	Hornsby Springs	FL	9800/270?	
Equus sp.	horse	Ichetucknee R garcia	FL	X ilium cut duplicate?	
Equus sp.	horse	Mandalay	FL	X 2L MT daggers Si1S2	
Equus sp.	horse	Simpson's Flats (Ich)	FL	X ilium cut SimpsonCol	
Equus sp.	horse	Silver Springs Cavern	FL	tooth no mod?	
Equus sp.	horse	Sloth Hole	FL	? Lots of material	
Equus sp.	horse	Steinhatchee #2	FL	X pelvis cut/tool? Thulm	
Equus sp.	horse	Wacassassa River #9	FL	X tibia tool	
Equus sp.	horse	Wakulla Springs	FL		
Equus sp.	horse	Warm Mineral Spings	FL		
Equus sp.	horse	Big Bone Lick	KY	1803 2 finds	
Equus sp.	horse	Valsequillo Valsequila	MEX	X? sp/brk CyI-w67 tool?	
Equus sp.	horse	Etna Cave	NV		
Equus sp.	horse	Fishbone Cave	NV	X? 5th MT awl	
Equus sp.	horse	Conkling Cave	NM	no artifacts but H. s.	
Equus sp.	horse	Coats-Hines	TN	teeth 34 artifacts	
Equus sp.	horse	Bee Co Buckner rnch	TX	Sellards UGSA1940	
Equus sp.	horse	Beeville	TX		
Equus sp.	horse	Bonfire Shelter	TX	X? cut split Clovis?	
Equus sp.	horse	Kincaid Rockshelter	TX	Zone 4 on pavement	
Equus sp.	horse	Levi Rockshelter	TX	X? probably burned	
Equus sp.	horse large	Lewisville	TX	X H 0,1+uid bone mn2?	
Equus sp.	horse medium	Lewisville	TX	X H 0,1 +uid bone mn6?	
Equus sp.	horse	Lone Wolf Creek	TX	Post Clovis	
Equus sp.	horse	Midland	TX	X? cut femur Vs context	
Equus sp.	horse	Plainview	TX	AA26:58 Grayson84	
Equus sp.	horse	Wilson-Leonard	TX	1 bone bed above Clovis	
Equus sp.	horse	Union Pacific Mam.	WY		
Equus sp.	horse	Baja	MEX	X? split and charred	
Equus caballus	horse	Aubrey	TX	Locus Ap no mni	
Equus mexicanus	stout legged horse	Lubbock Lake	TX	X? 3 cut split Lfront	
Equus francisi	small stilt leg horse	Lubbock Lake	TX	X? scotti radius	
Equus occidentalis	horse	Ventana Cave	AZ		
Equus occidentalis	horse	Potter Creek Cave	CA		
Equus occidentalis	horse	Sandia Cave	NM	bad?	
Equus niobrarensis	horse	Blackwater Draw bsw	NM	harris85	
Equus niobrarensis	horse	Blackwater Draw GS	NM		1
Equus niorbrarensis	horse	Burnet Cave	NM	2+?	
Equus scotti	horse	Blackwater Draw GS	NM		2

Equus scotti	horse	Gault	TX	X? scapula w/bl-biface	
Equus tau	horse	Burnet Cave	NM		
Equus conversidens	horse	Wally's Beach	ALB	X blood C2 point bones	
Equus conversidens	horse	China Lake	CA		
Equus conversidens	horse	Blackwater Draw GS	NM		1
Equus conversidens	horse	Burnet Cave	NM	asinus con? ~6+?	
Equus conversidens	horse	Gault	TX	X? scapula w/bl-biface	
Equus conversidens	horse	Colby	WY	X in M.c. bone pile	
Equus pacificus	horse	Potter Creek Cave	CA		
Equus excelsus/conversidens	horse	Sandia Cave	NM	bad?	
Tapirus veroensis	tapir	Lehner Ranch	AZ	X? burned jaw/stain?	
Tapirus veroensis	tapir	Murray Springs	AZ	X? Camp C7 HELPverify	
Tapirus veroensis	tapir	Ventana Cave	AZ		
Tapirus veroensis	tapir	Valsequillo Valsequila	MEX	? Drawn on Ma pelvis	
Tapirus veroensis	tapir	Fossil Hole	FL	X burn limb w/17k lithics	
Tapirus veroensis	tapir	Hornsby Springs	FL	X?	
Tapirus veroensis	tapir	Sloth Hole	FL	X? weak X, jaw cuts	
Tapirus veroensis	tapir	Wakulla Springs	FL		
Tapirus veroensis	tapir	Levi Rockshelter	TX	X? burned?	
Tapirus veroensis	tapir	Lubbock Lake	TX	E.J. 1977:71	
Proboscidean?	unspecified	Goldstream/Tanana V	AK	X 2 bone rodsab/bwd	
Proboscidean?	unspecified	Tranquillity Site	CA	X 2 bone rods E/C/B	
Proboscidean	unspecified	Upper Klamath Lake	CA	X? bone tools?	
Proboscidean	unspecified	Drake	CO	X? bone or ivory tool	
Proboscidean	unspecified	Edisto Beach	SC	X 1 cut rib	
Proboscidean	unspecified	Butler Site Suw.Riv.	FL	X elements unknown? C?	
Proboscidean	unspecified	Darby Springs	FL		
Proboscidean	unspecified	Little Salt Spring	FL		
Proboscidean	unspecified-Mammut?	Blue Springs Hole	FL	X? 2326 stabs SF Riv	
Proboscidean	unspecified	Santa Fe R. 12- 17	FL	X? 54439 MT stabs	
Proboscidean	unspecified	Warm Mineral Spings	FL	X?	
Proboscidean	unspecified	Arvilla	ND	X ivory tool Jenks35mnh	
Proboscidean	unspecified	Omaha area	NE	X?P/lumbarAughey1876	
Proboscidean	unspecified	Sandia Cave Folsom	NM	ivory Not tool!	
Proboscidean	unspecified	Sheriden Cave	OH	X 2 bone tools	
Proboscidean	unspecified	Gault	TX	X bone tool 1	
Proboscidean	unspecified	McFaddin Beach	TX	X ivory>bone tool	
Proboscidean	unspecified	Crook County Cache	WY	X bone tools	
Proboscidean	unspecified	Luc du Bonnet CAN	MAN	X fibula tool 17" AA16:2	
Proboscidean	unspecified	Tepexpan	MEX	X? skull with flake help	
Proboscidean	mast>mam	Aucilla 1/4 Mile Rise	FL	X 1 ivory tool B. Waller	
Proboscidean	mast>mam	Aucilla Below 98 Brid	FL	X 2 ivory tools	
Proboscidean	mast>mam	Aucilla WR above98	FL	X 1 haft end Mike Hutto	
Proboscidean	mast>mam	Aucilla General collec	FL	X 7 ivory Ellis Moore 6	
Proboscidean	mast>mam	Bent Palm-Aucilla	FL	X 1ivory tool fragment	
Proboscidean	mast>mam	Blackhole Cave	FL	X 1ivory tool fragment	
Proboscidean	mast>mam	Cypress Hole	FL	X ivory tools	
Proboscidean	mast>mam	Fossil Hole/Ward #1	FL	X 4 ivory tools	
Proboscidean	mast>mam	Gerrell Site	FL	X 1 ivory tool	
Proboscidean	mast>mam	Glory Hole	FL	X 1 barbed ivory tool	

Proboscidean	mast>mam	Ich. 8SU-5	FL	X 4 mendable =1 DATE
Proboscidean	mast>mam	Ichetucknee Springs	FL	X ivory tools 1+
Proboscidean	mast>mam	Ichetucknee Area iv	FL	X 2 ivory tools
Proboscidean	mast>mam	Ichetucknee Area iii	FL	X 3 ivory tools
Proboscidean	mast>mam	Ich DOT landing A viii	FL	X 1 ivory tool
Proboscidean	mast>mam	Ich. Simspon Collect	FL	X 5 102603#s
Proboscidean	mast>mam	Latvis-Simpson	FL	X 1 ivory tool
Proboscidean	mast>mam	Little River Rapids	FL	X 3 123760/123761+1nc
Proboscidean	mast>mam	Mandalay	FL	X 1 ivory tool, Si1Su2
Proboscidean	mast>mam	Mathen-Childers	FL	X 1+? ivory tool
Proboscidean	mast>mam	May's Point Site	FL	X 1 ivory tool
Proboscidean	mast>mam	Page/Ladson	FL	X 8 Iv +69457 husked T
Proboscidean	mast>mam	Ryan-Harley	FL	X ivory tool NOT Suwan.
Proboscidean	mast>mam	Santa Fe R. 1A	FL	X ivory tool
Proboscidean	mast>mam	Santa Fe Atlatl Hook	FL	X atlatl hookMcCracken
Proboscidean	mast>mam	Santa Fe River Waller	FL	X 123720/123739
Proboscidean	mast>mam	Silver River #2	FL	X biggest dia. Ivory tool
Proboscidean	mast>mam	Silver Springs	FL	X 2+? Ivory tools More?
Proboscidean	mast>mam	Simpsons Flat (Ich R)	FL	X 2+? Ivory tools
Proboscidean	mast>mam	Suwannee River	FL	X ivory tools 1+
Proboscidean	mast>mam	Taylor Co. Aucilla R.	FL	X 1 ivory foreshaft
Proboscidean	mast>mam	Totem Shoal	FL	X 8 ivory tools Simp1+
Proboscidean	mast>mam	Wacissa River	FL	X 1 ivory foreshaft
Proboscidean	mast>mam	West Run, Aucilla	FL	X 1 Joe Page AL guy
Proboscidean	mast>mam	Williams Landing #1	FL	X 1 ivory tool
Mammut americanum	mastodon	Fairbanks-nearby	AK	X yuman in skull Mc?
Mammut americanum	mastodon	Naco	AZ	AGE? H85:248 suspect
Mammut americanum	mastodon	Potter Creek Cave	CA	X? 3b+1,21sp,40mod
Mammut americanum	mastodon	Fowler Bridge Mast.	FL	X?
Mammut americanum	mastodon	Gilchrist Co.?ICH?	FL	X cut vert D/W96
Mammut americanum	mastodon	Hendrix Collection	FL	X molar graver, cut tusk!
Mammut americanum	mastodon	Hornsby Springs	FL	X?
Mammut americanum	mastodon	Ich Bison Land A1a	FL	X vest tusk atlatl hook
Mammut americanum	mastodon	Mathen-Childers	FL	X? Priscilla 400bone pin
Mammut americanum	mastodon	Page/Ladson	FL	X cut tusk radius 60814
Mammut americanum	mastodon	Silver Springs 8MR59	FL	bones mod?Cmid sec
Mammut americanum	mastodon	Sloth Hole	FL	X >33tools +62i?mni 4
Mammut americanum	mastodon	Suwannee 8GI1 Eq	FL	X pat anv 92-508-01disk
Mammut americanum	mastodon	Wakulla Springs	FL	X 3+mast? 1 ivory tool
Mammut americanum	mastodon	Big Bone Lick	KY	1803 2 finds
Mammut americanum	mastodon	Pleasant Lake	MI	10.395wd Bone probe?
Mammut americanum	mastodon	Island 35 mastodon	TN	X? stem in Pelvis
Mammut americanum	mastodon	Kimmswick	MO	X 2+? See Field Museum
Mammut americanum	mastodon	Sandia Cave	NM	bad?
Mammut americanum	mastodon	Hiscock	NY	X? 9+ bad bone tools
Mammut americanum	mastodon	Martins Creek	OH	X blood wear assoc.
Mammut americanum	mastodon	Coats-Hines Site	TN	X? cuts and 34 artifacts
Mammut americanum	mastodon	Murphey Site	TX	X? Story90 site gone
Mammut americanum	mastodon	Bee Co Buckner rnch	TX	Sellards UGSA1940
Mammut americanum	mastodon	Spring Lake Terrace	TX	teeth only?

Mammut americanum	mastodon	Manis (Sequim)	WA	X 2 b pt in ribs Age?
Mammut americanum	mastodon	Boaz	WI	X? 1897
Mammut americanum	mastodon	Lucas	WI	X? burns?
Mammut americanum	mastodon	Thames River CAN	ONT	X? 1 pond margin
Mammut americanum	mastodon	Valsequillo Valsequila	MEX	X? 2, drawn 2MaTvBa
F96 Mammut americanum	mastodon	Alma	MI	no artifacts- weak
F96 Mammut americanum f91	mastodon	Burning Tree	OH	X? cuts 11.660/11.450
F96 Mammut americanum	mastodon	Farview	NY	no artifacts- weak MI?
F96 Mammut americanum	mastodon	Grandville	MI	no artifacts- weak
F96 Mammut americanum	mastodon	Parker	MI	no artifacts- weak
F96 Mammut americanum	mastodon	Powers	MI	no artifacts- weak
F96 Mammut americanum	mastodon	Owosso	MI	no artifacts- weak
F96 Mammut americanum	mastodon	Sheathelm	MI	no artifacts- weak
F96 Mammut americanum	mastodon	Shelton	MI	no arch 12.320-10.970
F96 Mammut americanum	mastodon	Warren	NY	X? cut L ulna
F9x Mammut americanum	mastodon	Heisler	MI	not X 1 clastic anchors
F9x Mammut americanum	mastodon	Rappuhn	MI	remove?
Mammuthus sp.	mammoth	El Llano	TX	X? Fiedel 87:68
Mammuthus sp.	mammoth	Wally's Beach	ALB	tracks only?
Mammuthus sp.	mammoth	Broken Mammoth	AK	X 3 ivory tools CZiv
Mammuthus sp.	mammoth	Mead	AK	X? ivory tools?
Mammuthus sp.	mammoth	Swan Point	AK	12,060/60 ivory date
Mammuthus sp.	mammoth	Tanana Valley	AK	X most likely probo
Mammuthus sp.	mammoth	Walker Road Mam	AK	Nenana 11-11.3
Mammuthus sp.	mammoth	Potter Creek Cave	CA	
Mammuthus sp.	mammoth	Klein II	CO	X?
Mammuthus sp.	mammoth	Guest Kill/Silver Sprg	FL	X 6Ivory tools+ mam kill
Mammuthus sp.	mammoth	Big Bone Lick	KY	1803 2 finds
Mammuthus sp.	mammoth	Anzick	MT	X 11 b tools 2+ types
Mammuthus sp.	mammoth	Mammoth Meadow I	MT	ribs bola stone? HAIR
Mammuthus sp.	mammoth	Mill Iron	MT	X? rib socket older?
Mammuthus sp.	mammoth	Angus	NE	X, 300k? I like it
Mammuthus sp.	mammoth	Sandia Cave	NM	bad? Not tool ivory
Mammuthus sp.	mammoth	Burnet Cave	NM	Not in Howard 36
Mammuthus sp.	mammoth	Aubrey	TX	X? no? Camp B, area F
Mammuthus sp.	mammoth	Bee Co Buckner rnch	TX	Sellards UGSA1940
Mammuthus sp.	mammoth	Bonfire Shelter	TX	X? split and broken?
Mammuthus sp.	mammoth	Gault	TX	lower levels?
Mammuthus sp.	mammoth	Kincaid Rockshelter	TX	Zone 4 on pavement
Mammuthus sp.	mammoth	Lewisville	TX	L1 Tusk L2 femur head
Mammuthus sp.	mammoth	East Wenatchee	WA	X 14 bone rods
Mammuthus sp.	mammoth	Chesrow 1	WI	X?
Mammuthus sp.	mammoth	Schaeffer	WI	X? 1 cut pile 12.5-10.9
Mammuthus sp.	mammoth	Carter/Kerr-McGee	WY	X scap over G
Mammuthus sp.	mammoth	Hell Gap	WY	
Mammuthus sp.	mammoth	Hinrichs 48co1401	WY	
Mammuthus sp.	mammoth	Kaufmann Cave	WY	X? radius Hburn fossil?
Mammuthus sp.	mammoth	Rawhide Buttes	WY	X? >10,500/350
Mammuthus sp.	mammoth	Rawlins	WY	1 =UP Mc? 11.280
Mammuthus sp.	mammoth	Sheaman (A.B.9)	WY	X ivory tool+ bones?

Mammuthus primigenius	woolly mammoth	Potter Creek Cave	CA	Help ID count as M imp
Mammuthus primigenius	woolly mammoth	Schaefer	WI	X? 2flake/pelvis
Mammuthus imperator	woolly mammoth	Santa Isabel Iztapan	MEX	X point in ribs
Mammuthus imperator	woolly mammoth	Santa Isabel Iztapan 2	MEX	X 3,in ribs, cut rib
Mammuthus columbi	columbian mammoth	Broken Mammoth	AK	X 3+ivory tools
Mammuthus columbi	columbian mammoth	Escapula	AZ	X 1 runnoft
Mammuthus columbi	columbian mammoth	Lehner Ranch	AZ	X 13 (9im)
Mammuthus columbi	columbian mammoth	Leikum	AZ	X M.fl? 2 1Large mod?
Mammuthus columbi	columbian mammoth	Murray Springs	AZ	X 2 +bone wrench w/C3
Mammuthus columbi	columbian mammoth	Naco	AZ	X 1 runnoft
Mammuthus columbi	columbian mammoth	Navarette	AZ	X 1 bone handle
Mammuthus columbi	columbian mammoth	Schaldack	AZ	? CVH 87a
Mammuthus columbi	columbian mammoth	Silktassel	AZ	
Mammuthus columbi	columbian mammoth	Vernon	AZ	
Mammuthus columbi	columbian mammoth	China Lake	CA	X?2 ivory shem Davis78
Mammuthus columbi	columbian mammoth	Dent	CO	X 15 No Screening I bet
Mammuthus columbi	columbian mammoth	Dutton	CO	X? 1 tool?
Mammuthus columbi	columbian mammoth	Hillsborough River	FL	X cut vert spine ETHem
Mammuthus columbi	columbian mammoth	Hillsborough River	FL	X spine 160782,160874
Mammuthus columbi	columbian mammoth	Santa Fe R. 1A	FL	X cut vert uf14916 B70
Mammuthus columbi	columbian mammoth	Silver Springs Cavern	FL	bones no mod?
Mammuthus columbi	columbian mammoth	Sloth Hole	FL	mni 1, 2 tooth frags
Mammuthus columbi	columbian mammoth	Wakulla Springs	FL	
Mammuthus columbi	columbian mammoth	Withlacoochie R.	FL	X Rib mattock
Mammuthus columbi	columbian mammoth	Wasden/Owl Cave	ID	not X 1, ass. Not good
Mammuthus columbi	columbian mammoth	Lindsay	MT	X? cut stack? 11.9-10.8
Mammuthus columbi	columbian mammoth	Delong	NV	X? 3+ 16-10k stem/sq b
Mammuthus columbi	columbian mammoth	Bigbee Site	NM	X? surf pt Haynes54
Mammuthus columbi	columbian mammoth	Blackwater Draw bsw	NM	harris85 tusk
Mammuthus columbi	columbian mammoth	Blackwater Draw GS	NM	X 15 3w/arch 4j b/i tools
Mammuthus columbi	columbian mammoth	Mockingbird Gap	NM	Harris 1985
Mammuthus columbi	columbian mammoth	Lucy	NM	Not X?
Mammuthus columbi	columbian mammoth	Sandia Cave	NM	bad?
Mammuthus columbi	columbian mammoth	Sandia Cave	NM	bad?
Mammuthus columbi	columbian mammoth	Stolle Mammoth	NM	X? broken bones
Mammuthus columbi	columbian mammoth	Domebo	OK	X 1 killed juv fem+2?
Mammuthus columbi	columbian mammoth	Lange/Ferguson	SD	X 2 ad 1 jv flakes weak
Mammuthus columbi	columbian mammoth	Lubbock Lake	TX	X 3+?
Mammuthus columbi	columbian mammoth	McLean	TX	X 1, jaw more? 1 flake
Mammuthus columbi	columbian mammoth	Miami: Cowan Ranch	TX	X 5 Mc
Mammuthus columbi	columbian mammoth	Spring Lake Terrace	TX	teeth only?
Mammuthus columbi	columbian mammoth	Huntington Canyon	UT	X? 1cuts lithics 11.5-9.5
Mammuthus columbi	columbian mammoth	Hebior	WI	X? 12.5k stone tools
Mammuthus columbi	columbian mammoth	Colby	WY	X 7 cache? Bone tools?
Mammuthus columbi	columbian mammoth	Union Pacific	WY	X? 1 11.280/350 no artif
Homo sapien	people	Anzick	MT	10680/50-10940/90
Homo sapien	people	Conkling Cave	NM	no artifacts but ex fauna
Homo sapien	people	Fishbone Cave	NV	level 3 or 4? Harris85
Homo sapien	people	Durham Cave #2	PA	Date, not in site list 2?
Homo sapien	people	Silver Springs Cavern	FL	skull frag in headspring

Homo sapien	People	Warm Mineral Spings	FL	Zone 3 93-9800 NEW
Homo sapien	People	East Wenatchee	WA	X blood on points
Homo sapien	People	Tongue Creek Site	AlB	w Ba Eq cvh87

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BIOGRAPHICAL SKETCH

The author is a serious collector of beer cans and older breweriana who is always pleased to add to his collection. Other deep and abiding interests include bicycle racing, Native American history, and American advertising.

The 1991 Bachelor of Arts from the Anthropology Department of the University of Arizona and the 1999 Masters of Art from the University of Florida were the stepping stones to the ultimate educational goal. From this point on anything can be read for fun; as reading always should be.

I certify that I have read this study and in that my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

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May 2004

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